



November 9, 2018

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U.S. Department of Justice  
601 D Street NW  
Washington, D.C. 20004  
Re: DOJ No. 90-5-1-1-10157

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RE: Civil Action No. 1:15-cv-00291-WWC: City Beautiful H<sub>2</sub>O Program Plan – Response to EPA Comments

To Plaintiffs, Civil Action No. 1:15-cv-00291-WWC:

Capital Region Water (CRW) submitted its City Beautiful H<sub>2</sub>O Program Plan (CBH2OPP) to EPA/DEP on April 1, 2018, the required submittal date under the partial Consent Decree. CRW received a letter from the EPA dated July 6, 2018 requesting responses to review comments. This letter provides clarifications to EPA's overall assessment of the CBH2OPP presented in EPA's cover letter, as well as a point by point response to each comment in the attachment to the letter. We request a meeting at your earliest convenience to review these responses, provide additional clarification, and discuss next steps.

**Response to EPA Cover Letter Comments:**

CRW provides the following clarifications to several interpretations of the CBH2OPP expressed in EPA's cover letter.

**Cover Letter Comment 1:**

*The Environmental Protection Agency (EPA) received the Capital Region Water's (CRW) City Beautiful H<sub>2</sub>O Program Plan Long Term Control Plan (LTCP or Plan), dated March 29, 2018. The Partial Consent Decree (PCD) at Section V. E., Paragraph 14 requires CRW to submit for review and approval*

*a revised and updated LTCP that conforms to the requirements of EPA's 1994 CSO Control Policy (CSO Policy) and Guidance for Long Term Control Plan, as well as additional guidance on green infrastructure and integrated planning.*

### Cover Letter Response 1:

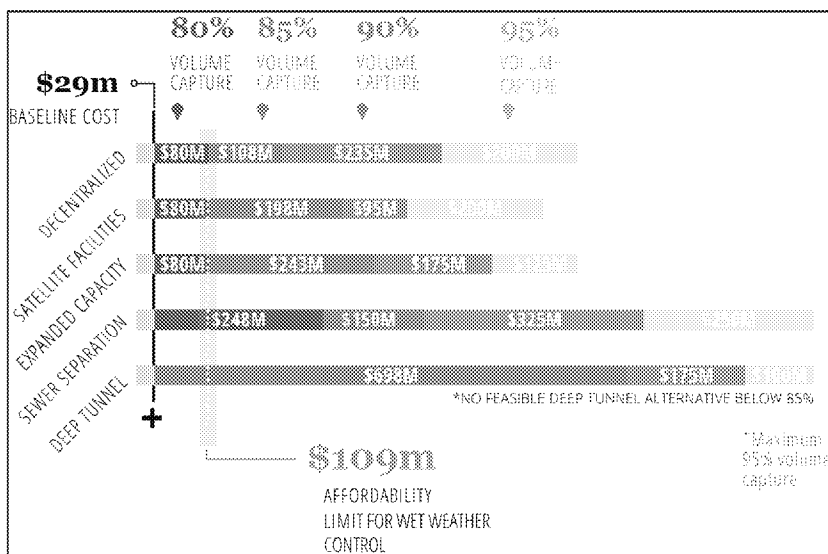
EPA mistitled CRW's submittal, calling it the "City Beautiful H<sub>2</sub>O Program Plan Long Term Control Plan (LTCP or Plan)". This misrepresents the intent of the submittal, which is an Integrated Municipal Stormwater and Wastewater Plan prepared according to EPA's framework dated June 5, 2012. It includes CRW's CSO LTCP, but transcends a stand-alone LTCP by also addressing sanitary sewer overflows (SSOs), municipal separate storm sewer system (MS4) discharges, total maximum daily load (TMDL) reductions, and other sources of water quality impairment within the Harrisburg metropolitan area. As is appropriate for such a plan, it establishes priorities for improving water quality that transcend CSO-centric control objectives, particularly as they relate to sediment and nutrient TMDLs for Paxton Creek and the Chesapeake Bay.

### Cover Letter Comment 2:

*EPA has reviewed the LTCP and concludes that it does not comply with the requirements specified in the PCD, and therefore the submission is disapproved. In fact, Section 11.5 of the LTCP specifically acknowledges that the proposed LTCP will not result in compliance with the CSO Policy and the Clean Water Act (CWA), noting that "CRW does not expect to achieve compliance with water quality objectives for designated uses." As such, in accordance with Section X of the PCD, CRW has failed to comply with the PCD and is potentially subject to stipulated penalties for such failure.*

### Cover Letter Response 2:

This quote from Section 11.5, "CRW does not expect to achieve compliance with water quality objectives for designated uses" is out of context. CRW does expect that ultimately its efforts will achieve compliance with water quality objectives for designated uses, but not within the 20-year immediate- and near-term implementation phases defined in detail in the Plan. Future phases beyond year 20, as shown in the embedded graphic from the CBH2OPP Companion Document, were not described in detail but can be derived for various control levels from information in the Plan. Attached Table 5 provides the levels of control and the associated costs to achieve a range of overflow captures and frequencies during the typical year under the



recommended alternative, a decentralized green-grey stormwater control strategy. These ranges would likely result in water quality compliance. Our responses to Comments 13 and 22 offer clarifying information of CRW's anticipated mid-term and long-term actions to ultimately meet water quality objectives for designated uses.

**Cover Letter Comment 3:**

*CRW's failure to comply with the terms of the PCD are demonstrated primarily by: 1) CRW has selected the Presumption Approach for achievement of water quality standards (WQS), using the 85 percent capture criterion, yet, on its face, the selected alternative would not meet WQS and would only achieve 80 percent capture after the 20-year completion of the LTCP;*

**Cover Letter Response 3:**

The EPA statement that, "*CRW has selected the Presumption Approach...*" is not correct. CRW is committed to meeting water quality objectives for designated uses but needs to work closely with EPA and DEP through an adaptive management approach to better define compliance endpoints as the Plan is implemented. Our responses to Comments 13 and 26c offer additional details on CRW's adaptive management and compliance monitoring approaches to support this. The compliance endpoint will need to take into account the high-frequency, low-duration nature of CSO discharges from the CRW system.

**Cover Letter Comment 4:**

*2) CRW has considered a limited number of CSO control alternatives, failing to even identify the specific projects proposed to be completed, along with associated costs;*

**Cover Letter Response 4:**

CRW disagrees with this assessment. A broad range of technologies are evaluated and screened in Section 6 to identify those most feasible for two systemwide and three local control strategies. Section 8 evaluated each control strategy based upon "knee of the curve" cost-performance and triple bottom line benefits, with a decentralized green-grey stormwater control strategy recommended. Our response to Comment 32a, supported by Attachment Tables 1 through 4, offers a broader description of the alternatives evaluated and additional details on the specific projects recommended for implementation during the immediate implementation phase (first 10 years).

**Cover Letter Comment 5:**

*and 3) CRW has failed to complete a Financial Capability Assessment (FCA) that complies with the PCD (Paragraph 18) as noted previously in EPA's September 9, 2016 letter to CRW (see attached).*

**Cover Letter Response 5:**

CRW disagrees with this assessment. We believe the EPA position to be an expansion in the scope of the FCA requirements beyond the "Harrisburg Sewer System" as specified in paragraph 18 of the



PCD. Therefore, we believe we have satisfied the requirement to provide the Plaintiffs with a full and complete FCA. Our responses to Comment 21 offer clarifying information on preparation of the FCA.

Per the teleconference with CRW and EPA held on November 1, 2018, CRW will continue to coordinate with EPA staff and consultants to revise the Residential Indicator calculation of the FCA to reflect the satellite community incomes and system costs and to reflect total projected cost of compliance, rather than the amount that results in CRW meeting the high burden threshold.

**Cover Letter Comment 6:**

*Both the Pennsylvania Department of Environmental Protection (PADEP) and EPA are fully aware of the extensive deferred maintenance of the Harrisburg wastewater system and understand the need to address this as part of the remediation of the system. CRW's proposed measures would focus on this remediation in the first 10 years, to achieve 79 percent capture by year 10 (from the current 53 percent capture level). Arguably, these are proposed measures that are covered under the Nine Minimum Controls (e.g., regulator upgrades).*

**Cover Letter Response 6:**

CRW disagrees with the EPA assessment that, "Arguably, these are proposed [system rehabilitation] measures that are covered under the Nine Minimum Controls...." According to EPA's May 31, 1995 cover memorandum for its "Guidance for Nine Minimum Controls", the Nine Minimum Controls are, "... minimum technology-based controls that can be used to address CSO problems without extensive engineering studies or significant construction costs". CRW has identified over \$100M of system improvement costs over the next ten years that achieve the dual objectives of extending useful life AND reducing CSOs (i.e., increasing capture from 53% to 79%). Attached Tables 1 through 3 provide additional documentation with this response to demonstrate that the extent, engineering requirements, and cost of these improvements far exceed expectations under the NMCs.

**Cover Letter Comment 7:**

*Measures proposed to occur between years 10 and 20 would result in only a one percent additional increase in CSO capture. This is unacceptable. CRW is proposing a Plan that focuses on system rehabilitation with only a limited amount of CSO control measures. Under the proposed LTCP, several CSOs appear likely to remain active 30 to 50 or even more times per typical year, which cannot possibly result in the achievement of WQS.*

**Cover Letter Response 7:**

The Statement, "CRW is proposing a Plan that focuses on system rehabilitation with only a limited amount of CSO control measures..." misrepresents CRW's approach, which prioritizes projects that can jointly achieve system rehabilitation AND wet weather control needs. Our response to Comment 10 provides additional detail. The focus of the immediate implementation phase is to recover the functionality and enhance the capacity of CRW's interceptors, regulators, and pumping



stations to deliver as much flow to the advanced wastewater treatment facility (AWTF) as practical. Attachment Tables 1 through 4 provide additional details on the specific projects proposed for the immediate implementation phase. The findings of detailed CCTV collection system inspections and hydraulic evaluations are required to define specific projects for future implementation phases.

**Cover Letter Comment 8:**

*The selected CSO controls set forth in the LTCP must be designed to meet the overarching goals of bringing all CSO discharge points into full compliance with the technology-based and water quality-based requirements of the CWA and minimizing the impacts of CSOs on water quality, aquatic biota and human health.*

**Cover Letter Response 8:**

It is understood that the ultimate goal of all CSO LTCPs is to meet water quality objectives for designated uses. Attached Tables 1 through 4 provide additional detail on projects to be implemented during the next 20-years, and responses to comments #13 and #26c describe how the adaptive management process will be applied to define needed investments to achieve additional levels of control. CRW is prepared to work with EPA and DEP to define a compliance timeline of specific structural and non-structural future milestones, including specific decision points where progress will be assessed, and future directions determined. The adaptive management process, with formal reports submitted every 5 years, will document how significant new information (i.e. CCTV inspection results), new opportunities (i.e. decentralized CSO controls linked to needed City collection system rehabilitation), and/or unexpected implementation complications (i.e. Paxton Creek interceptor rehabilitation) will be used to shape and refine the evolving implementation of the Plan.

**Cover Letter Comment 9:**

*Available CSO control technologies are not intended to be limited by cost. CRW must identify and adequately evaluate an appropriately broad range of technically feasible CSO controls regardless of the cost of each. The FCA serves to help establish an appropriate CSO control implementation schedule.*

**Cover Letter Response 9:**

We believe the Plan is clear that alternative control technologies were NOT screened out based on cost alone. Our narrative and tabular responses to Comment 22 provide additional information and details. The Plan was prepared in compliance with EPA guidance, and alternative control technologies were evaluated and screened (in Section 6 of the Plan) on the basis of technical feasibility and site constraints. Alternative control technologies that were found to be technically feasible and conformed to site constraints were carried forward to the Alternatives Analysis in Plan Section 8. The decentralized green-grey stormwater control strategy was recommended through a cost-performance and triple bottom line alternative evaluation process that considered site-specific constraints, benefits, and costs. It was not until implementation phases were defined in Section 11



that the immediate- and near-term cost limitations defined by the FCA were used to identify specific projects for implementation. Detailed commitments to specific projects focused on an initial 20-year implementation period due to significant uncertainties in collection system renewal needs, which in turn could be linked to specific projects to also achieve wet weather control.

**Comment 1:**

*Executive Summary highlights the City of Harrisburg's (City) financial challenges (see pages ES-1 and 2). While the City is acknowledged to have significant financial challenges, recent metrics such as unemployment and median household income (MHI) have displayed encouraging trends over the last year or two.*

**Response 1:**

Acknowledged.

**Comment 2:**

*Section 1.2.1 presents an example of Capital Region Water's (CRW) existing combined sewer overflows (CSO) warning signs. The sign does not appear to clearly indicate that the discharge contains untreated sewage or poses a health risk, as it should. The font in the example needs to be changed to be easily read from a reasonable distance.*

**Response 2:**

Capital Region Water's CSO warning signs are 36" x 36", more than the minimum size listed in the partial consent decree (24"x18") and are easily read from a reasonable distance. Signs installed in the future will include language indicating that the discharge contains untreated sewage containing harmful bacteria. See Attachment Figure 1 for a full-page example of the 36"x 36" sign.

**Comment 3:**

*Section 1.3.1 describes CRW's service area. This section notes that CRW has the following suburban communities as wholesale customers:*

- Lower Paxton Township
- Paxtang Borough
- Penbrook Borough
- Steelton Borough
- Susquehanna Borough
- Swartara Borough [sic]

*Together, these communities have a total population of approximately 106,000, as compared to the City of Harrisburg's population of approximately 49,000. CRW does not provide service to 100% of each of the above communities; however, it appears that CRW provides wastewater treatment for at least 70,000 persons in those wholesale communities.*

**Response 3:**

Acknowledged.

**Comment 4:**

*Section 1.4.5 discusses hydraulic capacity problems in the Spring Creek Interceptor. The Plan notes that sanitary sewer overflows (SSOs) may occur from this interceptor, that "over 90 percent of the flow in the Spring Creek interceptor is generated by the suburban communities," and furthermore that a "regional/intermunicipal solution is needed for the Program Plan." CRW provides no indication that it is actively pursuing such a regional solution to wet weather flows. As discussed elsewhere, CRW has instead assumed that CSO control is solely the City of Harrisburg's responsibility. The Partial Consent Decree (PCD) requires CRW to consider system-wide controls and EPA's Financial Capability Assessment (FCA) Guidance requires CRW to consider its entire service area, even if it encompasses multiple jurisdictions. Describe CRW's efforts working with the suburban communities to develop a regional wet weather flow plan.*

**Response 4:**

For the Spring Creek Interceptor hydraulic capacity problems, CRW provided the five suburban wholesale customers that send flows through Spring Creek interceptor with a September 13, 2017 technical memo detailing our hydraulic evaluation of the interceptor. We subsequently convened a meeting on January 26, 2018 to discuss the hydraulic capacity limitations of the line. The meeting was attended by representatives of Susquehanna, Lower Paxton and Swatara Townships. CRW will continue to collaborate with the suburban communities.

While the final portion of the interceptor lies within the City of Harrisburg, the majority of the contributory drainage basin (10.5 of 11.4 acres) lie outside the City, and the interceptor primarily serves the five suburban municipalities (Penbrook and Paxtang Boroughs, Susquehanna, Lower

Paxton and Swatara Townships). Therefore, CRW believes that the leadership on this project should lie with the suburban municipalities.

**Comment 5:**

*Section 1.8.2 presents an overview of the systemwide control strategies considered by CRW. The description of Systemwide Strategy 2 highlights the construction of a deep tunnel. Many controls evaluated by CRW, including this one, use what appears to be an unnecessarily large "minimum feasible size." In this case, CRW determines that a 14 million-gallon (MG) tunnel represents the smallest feasible control level. Such a determination has the effect of ensuring that a control strategy is technically or physically "infeasible," given CRW's determined level of affordability. CRW should reevaluate use of this potential control.*

**Response 5:**

CRW believes that a rigorous evaluation of deep tunneling options was conducted. While the deep tunnel alternative is considered a feasible alternative (per Section 6 of the CBH2OPP), the cost-performance and triple-bottom line evaluation of alternatives presented in Section 8 of the CBH2OPP determined that the deep tunnel alternative is the least cost-effective of the five alternative control strategies under consideration by CRW. The deep tunnel size reductions suggested by EPA would further diminish the cost-effectiveness of this alternative.

- Paragraph 22.a of the PCD requires the consideration of "deep tunnel storage" as part of the alternatives evaluation as a feasible technology. The combined sewage overflow reduction effectiveness of deep tunnel storage compared to other technologies rely on the ability to collect and direct combined sewage flows from large portions of the combined sewer system. The deep tunnel control strategy presented is intended to illustrate systemwide control for most or all of the CSO outfalls. In order to direct most or all CSO locations to a deep tunnel would require a deep tunnel system roughly the length of the Front Street interceptor plus the length of the Paxton Creek interceptor (up to 52,000 feet).
- The minimum diameter of 10 feet is established by commercially-available deep tunnel boring machines and an assessment of deep tunnel systems for combined sewage systems cited in the Philadelphia Water Departments Alternative Costing Tool documentation.
- Deep tunnel storage systems require various shafts to allow for flow conveyance, access, ventilation, and continued operation and maintenance, with a 10 foot minimum diameter providing reasonable functionality for these considerations as well as structural integrity due to the uncertainty of underground materials and conditions.
- This minimum diameter in combination with the minimum length selected and considerations for pipe slope and ventilation yields the minimum cited effective storage volume of 14 MG.
- Deep tunnel projects involve a high mobilization cost for the boring machine and relatively high fixed costs for drop shafts and dewatering pump stations. A shorter length or smaller

diameter tunnel would yield less CSO reduction performance without significant reductions in cost.

- Smaller diameter pipes can be considered for gravity-drained near-surface tunnel construction methods and were considered for parts of the Systemwide Strategy 1 and Local Strategy 2 to facilitate conveyance of combined sewage. The deep tunnel storage alternative strived to achieve higher levels of systemwide CSO reduction by using a larger tunnel. The resulting alternative cost indicates the 10 feet diameter system is less cost-effective than other alternatives evaluated at a similar control level.
- High mobilization and fixed costs associated with deep tunnels also diminish the cost-effectiveness of “hybrid” strategies suggested by EPA. Instead, hybrid solutions such as satellite storage with conveyance/consolidation sewers are not considered “deep tunnels” but could be implemented with near-surface tunneling technologies that would allow gravity drainage.
- In addition, systemwide strategies do not address critical collection system capacity constraints that may cause unauthorized releases (e.g., surface/basement flooding, per EPA comment No. 14), a primary rationale for recommending a decentralized green-grey stormwater control strategy able to provide control of both CSOs and unauthorized releases.

**Comment 6:**

*Table 1-3 summarizes the limited amount of green infrastructure (GI) that CRW proposes to implement within the proposed 20-year Plan. Note that the City-wide Cumulative GI Implementation target of 3% of the impervious area is only 66 acres,*

**Response 6:**

The comment only acknowledges GI projects for the first 10 years and overlooks anticipated GI projects for implementation years 11 through 20. Table 1-3 of the CBH2OPP summarizes the Preferred Control Strategy – Decentralized Controls (Green/Grey), breaking out two implementation periods over the 20-year plan in the right columns, Immediate (years 1-10) and Near-Term (years 11-20). The Immediate (years 1-10) City-wide Cumulative GI Implementation target is 3% of the impervious area and the Near-Term (years 11-20) City-wide Cumulative GI Implementation target is 5% of the impervious area for a total of 8%. This is approximately 177 acres of impervious area targeted for GSI implementation. Additional GI implementation is also expected through redevelopment projects and/or roadway reconstruction projects expected over the 20-year implementation period. These projects were not included because they do not require CRW funding, nor is an estimate of potential impervious area control possible at this time. CRW believes that controls of at least 8 percent of the impervious area over this initial 20-year time frame is equivalent to other similar programs and forms a firm foundation for achieving additional control beyond year 20.

**Comment 7:**

*Section 1.9.2 discusses CRW's proposed adaptive management process. CRW is proposing "decision points" at 10 years, 15 years, and perhaps 20 years at which Plan adjustments may be made. The degree to which CRW anticipates EPA and PADEP reviewing and approving such adjustments needs to be addressed. Since CRW's current Plan is inadequate, EPA recommends that the Adaptive Management Plan be submitted every five years.*

**Response 7:**

Under its adaptive management approach, CRW proposes a comprehensive review of the program status at years 10 and 15, with supporting documentation and reporting to EPA/DEP via *Adaptive Management Plan Update Reports*. As requested by EPA, CRW will add a status review and report submission at year 5, at year 20, and every subsequent five years during the mid-term and long-term implementation periods. The *Adaptive Management Plan Update Reports* would contain:

- A summary of significant projects or project elements that have been completed with the associated costs and implementation dates.
- A summary of new information, new opportunities, unexpected implementation complications, etc. that prompts a request and subsequent discussion with EPA/DEP to revise the scope, schedule, or budget of specific Plan elements.
- An updated list of the specific projects that will be implemented in the next 5-year implementation period along with their associated implementation schedules.

Updates on the adaptation and implementation of the Plan will also be provided through CRW's existing annual progress reporting process. The following topics would be addressed within the annual reports:

- As significant new information (i.e. CCTV inspection results), new opportunities (i.e. a developer proposes a new project), and/or unexpected implementation complications (i.e. Paxton Creek Interceptor rehabilitation) are encountered and assessed, CRW will proactively notify EPA/DEP and discuss how the new situation will impact the scope, schedule of the project for EPA/DEP comment and approval.
- Request EPA/DEP to provide a review of receiving water quality trends and emerging issues, including ongoing/proposed water quality monitoring/assessment programs that could be integrated with CRW's compliance monitoring requirements.
- If scope/schedule/budget revisions for an individual project would have a significant impact on implementing the remaining portions of the Plan, proposed adaptations and revisions to the Plan would be discussed with EPA/DEP for comment and approval.

The combination of the annual reporting and the comprehensive five-year reporting will address all the coordination needs for the ongoing implementation CRW Plan through the adaptive

management process. EPA's and DEP's role in both categories of reporting would be the review, discussion, and approval of needed adaptations or revisions to Plan budgets, schedules, and priorities in response to new information, new opportunities, and new situations.

**Comment 8:**

*Public Participation: Section 1.2.1 describes CRW's public involvement efforts in support of release of the plan, specifically three public meetings with a total of only 29 attendees at the three meetings. Section 2 describes CRW's public engagement/participation efforts in more detail. It is noted that CRW did convene a stakeholder committee; however, it appears that only a limited number of meetings took place beginning in mid-2017, which is far too late in the LTCP development process. EPA suggests CRW engage the public again before submitting its revised LTCP.*

**Response 8:**

The existing narrative within Section 2.2.2 of the Plan demonstrates that community engagement was an essential component throughout the three-plus year development period of Capital Region Water's City Beautiful H<sub>2</sub>O Program Plan (CBH2OPP). Community engagement began in support of CRW's Community Greening Plan (as cited), an integral element of the overall planning process required under the PCD. Two large public engagement phases, one in the winter of 2016 and one in the summer of 2016, were held including several large events and more than thirty smaller engagement opportunities throughout the process. The process engaged over 1,000 residents from all areas of the city. The Community Greening Plan released in January 2017, established the specific priorities and forms of green stormwater infrastructure (GSI) that were compared with other wet weather control alternatives under the CBH2OPP.

Stakeholder involvement in the Greening Plan is a key part of stakeholder involvement for the CBH2OPP since the entire rationale for the Greening Plan is to achieve wet weather control in a way that supports multi-objective community needs. From winter 2016 to Spring 2018, Capital Region Water also participated in over 150 community-lead events where we would provide information on all of our initiatives, including the strategies outlined in the Community Greening Plan and the City Beautiful H<sub>2</sub>O Program Plan.

Capital Region Water continues to be committed to public engagement and will update our stakeholder committees, hold additional public meetings, and go to neighborhood meetings to support implementation of the full breadth of wet weather control measures recommended under the CBH2OPP in 2018 and 2019.

**Comment 9:**

*Section 3.2.3 notes that both the Front Street and Spring Creek Pump Stations are "over 50 years old, and have exceeded its service lives, and in need of significant remedial maintenance and reconstruction." Rehabilitation and upgrading of both stations are identified as Baseline Control Level projects. CRW must explain how the upgrades to the pump stations will contribute to CSO reduction in addition to being one of the Nine Minimum Controls (NMCs).*

**Response 9:**

Each project is intended to rehabilitate existing pump station structures, replace/repair aged mechanical and electronic equipment, and increase pumping capacity to the maximum extent practical within existing pump station structures. This results in an increase in the hydraulic capacity of the Front Street pump station from 40 mgd to 60 mgd, and at the Spring Creek Pump Station from 18 mgd to 30 mgd. This additional capacity, coupled with recommended baseline improvements to CSO regulators, increases conveyance of wet weather flows to the AWTF, which in turn increases CSO capture during the typical year from 53 percent to 79 percent. As was explained in Cover Letter Response 6, a significant level of detailed engineering analysis is required, and the total effort far exceeds the expectations of the NMCs.

**Comment 10:**

*Section 4 presents a discussion of CRW's problem analysis and priorities. It appears that CRW is prioritizing asset management issues rather than CSO control and SSO elimination needs.*

**Response 10:**

CRW disagrees with EPA's assessment, as was stated in Cover Letter Response 7:

- EPA's review comments reflect an apparent misunderstanding of the CRW CBH2OPP, which recognizes that, due to the condition of the systems, many projects must be completed first to stabilize and strengthen the current structures and mechanical equipment before steps can be taken to maximize regulator, interceptor and pump station conveyance capacities.
- In the immediate implementation phase (years 1 through 10), CRW has recommended projects that fulfill both critical system rehabilitation needs AND maximization of the hydraulic capacity of existing infrastructure. Specific details are provided in Attachment Tables 1 through 4. The CBH2OPP proposes a series of joint rehabilitation and capacity enhancement modification projects, all to consistently achieve the full hydraulic capacity of CRW's conveyance systems (i.e., regulators, interceptors, and pumping stations), deliver as much flow to the Advanced Wastewater Treatment Facility (AWTF) as practical, and consistently provide primary treatment of this flow. As previously stated, the projected performance of these improvements should increase CSO capture from 53% to 79% system-wide.
- During near-term, mid-term, and long-term implementation phases (beyond year 10), CRW expects to extend this approach into the collection system, seeking opportunities to increase the conveyance and/or storage capacity of collection system pipes replaced to address structural deterioration issues. In addition, CRW will identify opportunities to integrate underground storage into system rehabilitation projects AND incorporate green infrastructure into restoration of surface features (i.e., roads, parking lots, parks, etc.) This integrated approach is expected to increase the overall cost-effectiveness of the program.

**Comment 11:**

*Figures 4-1 and 4-2 illustrate predicted peak typical year hydraulic grade lines (HGLs) compared to CSO weir elevations along the Front Street Interceptor and the Paxton Creek Interceptor, respectively. These figures illustrate how many weirs are at low elevations, relative to their interceptor invert, and these interceptors need to be candidates for weir height increases.*

**Response 11:**

The existing narrative within Section 8.2.1 of the Plan, along with Table 8.2-2, makes it clear that the baseline level of control includes making modifications to most CSO regulator structures to maximize the capture of CSO discharges and optimize hydraulic performance. These modifications include raising the crest elevations of the diversion dams at regulator structures where such actions are beneficial and feasible (i.e., would not cause upstream flooding).

**Comment 12:**

*Section 4.3.2 presents individual CSO regulators' current performance statistics. Overall combined sewage percent capture is identified as 53%. CRW must clarify and confirm exactly how it is calculating percent capture, and how combined flow is defined and calculated.*

**Response 12:**

Capture of combined sanitary and stormwater flows requires first that wet weather events are defined. A wet weather event begins either when the flow in the pipe connecting the regulator to the interceptor increases to more than 5 percent of the dry weather baseflow or when combined sewer overflows begin. The event ends when flow conditions return to less than 5 percent of dry weather flow or the CSO ceases. Capture calculations are performed in two steps. Under existing conditions, captured volume is the volume of combined sewer flow that is sent to the AWTF during a wet weather event. In alternatives with CSO controls in place, captured volume includes both the volume sent to the AWTF plus the volume prevented from reaching the combined sewer system by source controls (infiltrated, evaporated, and/or transpired runoff volume). Percent capture is calculated as the ratio of the captured volume in a given alternative or scenario, during the sum of all the defined wet weather periods during the modeled typical year, to the sum of captured volume and volume overflowed to receiving waters in the existing condition.

The capture calculations are performed at each regulator. Each of the regulators is assigned to an interceptor system and the capture results from each regulator can be aggregated for that interceptor system. These results from the interceptors are further aggregated by the entire combined sewer system.

**Comment 13:**

*If CRW's draft LTCP were to be fully implemented as-is, the system would still have 30 to 50 CSO overflows in a typical year. Bacteria can be persistent in the environment as it does not wash down stream after a wet weather event. All bacteria, including fecal indicators such as *Escherichia coli* (*E. coli*) or enterococci, possess the ability to attach to inorganic and organic surfaces such as rocks, pipes,*

*or other surfaces. After attachment, sessile bacteria may excrete a slime coating and create what is known as a protective biofilm. Biofilms can pose a significant health risk and the Centers for Disease Control and Prevention estimate that 65 percent of human bacterial infections involve biofilms. Because of the protective nature of biofilms, approximately 1,500 times more of an antimicrobial agent can be required to kill bacteria within biofilm than planktonic bacteria.*

**Response 13:**

The first comment statement incorrectly categorizes the immediate (years 1 through 10) and near-term (years 11 through 20) implementation phases of the Plan as being “fully implemented.” As previously stated in Cover Letter Response 2, the ultimate goal of the CBH2OPP is to meet water quality objectives for designated uses, which will require multiple implementation phases beyond year 20. Our approach is summarized below:

- Attachment Tables 1 through 4 define specific and anticipated projects through year 10, which may be revised, and/or new projects identified through the adaptive management process, based on an assessment of ongoing CCTV inspections, implementation complications, and/or new opportunities.
- The FCA will be revised if necessary to quantify additional budget resources available for Plan implementation during years 11 through 20. Specific projects will be identified based on the completed CCTV inspections, and projects will be prioritized as “affordable” under the new FCA, subject to revisions through the adaptive management process.
- After completion of the “adapted” projects through year 20, the H&H model will be updated to reflect completed projects and revalidated to available monitoring data and used to refine the projected CSO control benefits of the projects implemented.
- The adaptive management approach will continue beyond Year 20 as necessary to define the additional control measures and projects needed to meet water quality objectives for designated uses.

CRW acknowledges EPA’s subsequent comment statements, but is unaware of local receiving water data linking biofilms to CRW’s CSO discharges:

- Existing water quality data near Harrisburg does not demonstrate the presence of biofilms.
- Existing water quality data near Harrisburg does not demonstrate elevated bacterial concentrations associated with biofilms.
- Existing water quality data near Harrisburg does not identify the source of bacteria that may contribute to biofilms.
- Existing DEP water quality standards for fecal coliform focus on bacterial concentrations within the water column.

- Known hydraulic complexities in the Susquehanna complicate simple characterizations of pollutant sources, fates, and impacts.

As indicated in the CBH2OPP, CRW would like to partner with EPA, DEP, and/or other entities to evaluate bacteria-related water quality issues in the Susquehanna River with a goal of establishing site-specific water quality-based criteria for wet weather conditions. CRW further proposes that such studies be incorporated into the adaptive management approach outlined under the CBH2OPP. Until such studies are completed, definitive predictions relating CSO control to water quality outcomes remain elusive.

**Comment 14:**

*Tables 4-8 and 4-9 present statistics regarding the number of trunk sewer manholes in the CRW combined system that are currently subject to surcharge in one-year through 10-year design storms. Table 4-9 suggests almost 100 manholes may experience overflows in storms as small as the one-year event. CRW should consider more to address this issue in the manholes' associated sewer segments to decrease the number of manhole overflows.*

**Response 14:**

The comment states CRW should consider more to address this issue, which is defined as an unauthorized release in the Partial Consent Decree and prohibited under Paragraph 34 of the Partial Consent Decree. Indeed, CRW has identified the control of unauthorized releases to be a priority equivalent to CSO control, SSO control, MS4 control, and infrastructure rehabilitation. One of the primary reasons for recommending the decentralized green-grey stormwater control strategy was its use of multi-objective stormwater controls within the collection system designed to jointly reduce CSOs and relieve local system backups/surcharging that contribute to prohibited unauthorized releases.

Specific multi-objective decentralized green/grey stormwater control projects scheduled for implementation within the collection system during the first 5 years of Plan implementation are identified in Attachment Tables 3 and 4. Additional opportunities and projects beyond the 5-year mark will be identified as CCTV inspections are completed and implemented through the adaptive management process:

- For many of the planning areas, proposed baseline controls include interceptor backflow prevention measures such as replacing the existing Brown and Brown regulators and providing simple backflow prevention devices such as flap gates. These measures would prevent potential backup from interceptor surcharging from impacting trunk and collection sewers in the vicinity.
- Most of the Planning Area subsections of Section 8 describe Local Control Strategy 1, which proposes decentralized green/grey stormwater controls to address CSOs and unauthorized releases (e.g., manhole overflows, basement backups) within the same project investments. As CCTV inspections are completed, the adaptive management process will identify collection

system renewal, street improvement, redevelopment, and/or other associated project opportunities able to incorporate decentralized green-grey stormwater controls sized to control both CSOs and unauthorized releases.

**Comment 15:**

*Table 4-11 provides statistics regarding the number of manholes in the CRW separate system that are currently subject to surcharge in one-year through 10-year design storms. Table 4-11 suggests that a limited number of manholes may experience overflows in storms two-year frequency or larger. CRW should consider more to address this issue in the manholes' associated sewer segments to decrease the number of manhole overflows.*

**Response 15:**

Similar to the response to Comment 14, the existing plan recommends decentralized green-grey stormwater control measures to address SSOs, including surcharged manholes, basement backups, and other unauthorized discharges within separate sanitary sewer systems. CRW notes, however, that the instances of sewer surcharging reported in the CBH2OPP are based solely on hydraulic modeling, and lack field confirmation to support the need for such controls. CRW's *Separate Sanitary Sewer Capacity Assessment Report*, submitted April 1, 2017, recommends that CRW proactively monitor wet weather conditions in these areas by tracking service requests to determine if model projections represent actual problems. The current plan identifies specific projects for the first 5 years of implementation and the requested additional measures will be identified and implemented through the adaptive management process as CCTV inspections and service request reviews are completed.

**Comment 16:**

*Section 4.6.1 discusses existing water quality issues. Table 4-13 presents designated use attainment status information, but it should more clearly identify the current attainment status, by waterbody segment number. CRW must clearly identify all individual water quality parameters for which standard exceedances have occurred in each receiving water.*

**Response 16:**

The PCD required CRW to submit memoranda summarizing existing water quality issues and pollutants of concern (December 29, 2014), and sensitive areas (April 1, 2016). EPA comments to each of these submittals were discussed in person and/or in written responses. Furthermore, the data supporting these memoranda were obtained from published, readily-accessible reports and DEP databases, which CRW has no reason to question. All these previous submittals are documented in the CBH2OPP and included on CRW's web site as supporting information. CRW believes, based on this prior communication with EPA, that these submittals have been accepted and, as such were summarized in the CBH2OPP. Unless further evidence of deficiencies is provided by EPA/DEP, CRW stands by the conclusions of these memoranda and their summaries in the CBH2OPP.

**Comment 17:**

*Section 4.6.5 discusses pollutants of concern (PoC). CRW has identified the following PoCs:*

- *Susquehanna River – Bacteria*
- *Paxton Creek – Sediment, Bacteria, Dissolved Oxygen/BOD*
- *Unnamed Tributary, Spring Creek – Sediment, Nitrogen/Phosphorus*
- *Chesapeake Bay – Sediment, Nitrogen/Phosphorus*

*The identification of PoCs must be based upon the consideration of all pollutants found to be in exceedance of applicable water quality standards. As noted above, it is not clear that CRW has considered all such pollutants. Having noted that, the identification of bacteria in the Susquehanna and sediment, bacteria, and DO/BOD in Paxton Creek (the two waters directly receiving CRW's CSO discharges) appears to be appropriate. CRW must confirm it has identified all PoCs for the Susquehanna River and Paxton Creek.*

**Response 17:**

See response to Comment 16.

**Comment 18:**

*Section 4.6.6 summarizes CRW's Sensitive Area and priority area findings. CRW identifies no Sensitive Areas or priority areas, despite contact recreation in the Susquehanna River, primarily from City Island. CRW notes that the River's cross section and the resulting flow patterns in the River prevent significant cross-river mixing. EPA has observed kayakers in the Susquehanna River adjacent to the Front Street Pump Station. CRW failed to provide information demonstrating that swimmers and kayak users from City Island do not venture towards the River's west bank and its CSO's discharge plumes.*

**Response 18:**

See response to Comment 16.

**Comment 19:**

*Section 6 identifies and discusses a list of CSO control technologies. One conveyance technology included is sewer rehabilitation. Sewer rehabilitation is primarily an asset management technology rather than a CSO control technology. Except in limited circumstances, sewer rehabilitation has limited effectiveness in reducing CSO discharge volumes or impacts. As noted above, CRW has proposed to spend a significant amount of the total dollars that it characterizes as affordable on collection system and Advanced Wastewater Treatment Facility (AWTF) rehabilitation. CRW has suggested that much of this rehabilitation expenditure will serve both purposes; however, CRW must provide support for that assertion.*

**Response 19:**

While sewer rehabilitation alone may have limited effectiveness in reducing CSO discharge volumes or impacts, as stated previously, the CBH2OPP is an integrated municipal stormwater and wastewater plan that addresses CSOs, SSOs, MS4s, TMDLs and other sources of water quality impairment, as stated in the response to Comments 14 and 15. The decentralized green-grey stormwater control strategy described in the CBH2OPP would integrate sewer rehabilitation projects with green/grey stormwater management control opportunities. For example, where analyses show it is cost effective, defective pipe reaches could be replaced with oversized pipes to provide peak shaving flow equalization. Alternatively, green stormwater infrastructure (GSI) measures such as street trees, sidewalk planters, rain gardens, surface and subsurface storage, and porous pavement could be integrated into the sewer rehabilitation projects to reduce effective impervious area and reduce runoff peaks/volumes reaching the sewer system. Flow attenuation and/or runoff peak/volume reductions would both increase CSO capture and reduce CSO frequency/duration.

**Comment 20:**

*Section 6 also includes in-stream storage and a group of "receiving water" technologies. In-stream storage is technically possible in a limited number of cases; however, regulatory and public acceptance challenges make this technology rarely worthy of serious consideration. The "receiving water" technologies may prove useful in addressing existing receiving water issues; however, they generally do not directly provide CSO control benefits. CRW did not consider offline storage like box culverts. Box culverts are good controls for CSO system with high frequency low volume overflows like the Harrisburg system. The LTCP must be revised to include evaluation of offline storage controls, such as box culverts.*

**Response 20:**

Since the CBH2OPP is an Integrated Municipal Stormwater and Wastewater Plan, it is appropriate to provide a broader range of feasible technologies than those suited only for CSO control. CRW did evaluate box culverts as one of several means of achieving satellite storage, typically in conjunction with potential consolidation sewers, in its evaluation of local control strategies in Chapter 8. Furthermore, Chapter 8 presents a "knee of the curve" cost-performance evaluation of a broad range of local satellite storage options, including a site-specific evaluation of the specific control points plotted on each curve. Since ambiguity exists with regard to the ultimate level of control required, approximate facility sizes can be extrapolated from the curves at this time, with design studies conducted if an alternative is deemed necessary under the adaptive management approach.

**Comment 21:**

*Section 7 presents CRW's FCA. CRW has confined its FCA to the City of Harrisburg. In applying costs to the City, CRW has apportioned rehabilitation costs to its wholesale customers; however, CRW has assumed that the City will bear the CSO control costs and has utilized the City's mean household income (MHI), rather than that of the entire service area. This is significant, as wholesale customers make up*

*roughly more than half of the service population and the service area MHI appears significantly higher than the City's (see Figure 7-5). CRW must respond to EPA's letter dated September 9, 2016 and submit an FCA which follows EPA's Guidance for Financial Capability Assessment and Schedule Development, dated February 1997, and the requirements of Section V.E. of the PCD. CRW must also incorporate all current and projected costs for all satellite customers for whom they collect wastewater.*

**Response 21:**

It appears from the comment that EPA may have misunderstood the FCA as it pertains to the allocation of the Plan costs to the wholesale customers of the system. The FCA that was submitted with the CBH2OPP on March 29, 2018 (summarized in Section 7) made considerations for the wholesale customers located outside of the City, factored in that the wholesale customers are anticipated to pay for their proportionate share of conveyance and treatment costs, and also considered the anticipated wholesale payments to CRW as a source of revenue to pay for the projected future cost of the wastewater system. The FCA appropriately allocated current and projected future wastewater system costs, including CSO and other wet-weather control-related costs, among City and wholesale customers in accordance with the type and level of service provided to these customers, and in accordance with industry-accepted cost of service principles. CRW does not provide wastewater collection services to these wholesale customers, and in accordance with inter-municipal agreements, as well as cost of service principles, these customers do not share in CRW's collection related costs. However, the FCA reflects the wholesale customer's contribution of revenues for paying for treatment and conveyance-related costs. For example, the FCA that was submitted reflects that approximately 57 percent of the wastewater treatment-related costs and 54 percent of the wastewater conveyance costs are borne by the wholesale customers of the system. As such, the City share of treatment and conveyance costs were reduced in the FCA to reflect the wholesale customer's share of the responsibility for paying for these costs.

Furthermore, projected future wastewater system costs, including CSO and other wet-weather control-related costs, were also allocated to CRW's wholesale customers, and the Plaintiff's statement that *"In applying costs to the City, CRW has apportioned rehabilitation costs to its wholesale customers; however, CRW has assumed that the City will bear the CSO control costs..."* is incorrect and entirely false. In fact, the FCA reflects that the projected interceptor, pump station, and treatment plant capital projects will be allocated to wholesale customers in proportion to the wholesale customer's flow contributions to the wastewater system. As such, the City share of projected treatment and conveyance costs under the proposed plan have been reduced to reflect the wholesale customer's share of the responsibility to pay for these costs.

The Plaintiffs are correct in their statement that *"CRW has utilized the City's mean household income (MHI), rather than that of the entire service area."* However, in doing so, CRW has appropriately reflected the revenue contribution and cost share that is anticipated to be borne by the wholesale customers (as described above). CRW cannot simply charge wholesale customers for the costs of improvements to the components of the wastewater system that they do not use or benefit from just because the wholesale customer community's MHIs are higher than that of the City.

In response to the Plaintiff's demand that *"CRW must also incorporate all current and projected costs for all satellite customers for whom they collect wastewater"*, we offer the following response. We believe the EPA position to be an expansion in the scope of the FCA requirements beyond the "Harrisburg Sewer System" as specified in paragraph 18 of the PCD. However, to facilitate future discussions between CRW and EPA staff and consultants, we would like to verify and confirm with EPA that the basis for their conclusion that the "FCA is deficient" is based on CRW's not incorporating the MHIs of the satellite suburban customer municipalities. That said, it is understood that to meet scheduling objectives for the Plan, assumptions and estimates for these satellite customer costs will need to be made.

However, the projected costs associated with all satellite customers for whom CRW collects wastewater are not currently available or known. CRW does not own, operate, or maintain these satellite customer wastewater collection systems, has no knowledge of studies that have been completed by the satellite communities with respect to forecasting total wastewater system costs over a long-term planning period, and has no jurisdiction over these satellite communities to require the satellite communities to complete and provide CRW with the results of such studies to be able to accurately forecast these costs. That said, if the Plaintiffs insist that CRW must incorporate all current and projected costs for all satellite customers, assumptions and estimates for these satellite customer costs will need to be made.

Based on the teleconference with CRW and EPA held on November 1, 2018, we also understand that a primary concern of the EPA is that the Residential Indicator calculation in the FCA that was submitted did not include CRW's total projected costs of compliance, but rather the amount of future capital spending that would result in CRW reaching the high burden level. To proceed with the requested refinement of the FCA, we anticipate that CRW and EPA staff and consultants will meet and discuss what these total projected compliance costs and what the related satellite community cost assumptions will need to be, and the magnitude of the associated estimated costs.

In response to the Plaintiff's demand that *"CRW must respond to EPA's letter dated September 9, 2016 and submit an FCA which follows EPA's Guidance for Financial Capability Assessment and Schedule Development, dated February 1997, and the requirements of Section V.E. of the PCD"*, we offer the following response. As discussed above, the FCA that was prepared and submitted complies with paragraph 18 of the PCD, and was prepared in general accordance with EPA's *Guidance for Financial Capability Assessment and Schedule Development, dated February 1997* based on the best available information at the time that the assessment was prepared. EPA's letter dated September 9, 2016 requested that CRW submit a complete FCA, which was in fact submitted as part of the CBH2OPP, dated March 29, 2018. EPA's letter also stated that the initial April 1, 2016 FCA that was provided by CRW to EPA *"does not include consideration of the wholesale customers located outside of the City of Harrisburg. Wholesale rates should be included in the financial analysis because wholesale rates reduce the total retail costs applied to the CRW wastewater system."* As explained above, the FCA that was submitted with the CBH2OPP on March 29, 2018 made appropriate considerations for the wholesale customers located outside of the City, factored in that the wholesale customers are anticipated to pay for their proportionate share of conveyance and treatment costs, and considered current and projected wholesale revenues as another source of revenue to pay for the projected

future cost of the wastewater system. Therefore, we believe we have satisfied the requirement to provide the Plaintiffs with a full and complete FCA. However, as discussed above, CRW will continue to coordinate with EPA staff and consultants to revise the Residential Indicator calculation of the FCA to reflect the satellite community incomes and system costs and to reflect total projected cost of compliance, rather than the amount that results in CRW meeting the high burden threshold.

**Comment 22:**

*Section 8.1 identifies the control objectives (levels of control or "LoCs") that were the focus of CRW's alternative analysis:*

- *Baseline LoC — Based upon an optimization of the existing collection system and AWTF.*
- *Affordable LoC — Based upon an allocation of the total dollars CRW has determined to be affordable.*
- *Cost-effective LoC — Based upon a knee-of-the-curve analysis, with costs including the allocated rehabilitation costs, as discussed above.*
- *Presumptive LoC — Based upon the achievement of 85% capture systemwide.*

*It should be noted that the first three LoCs do not target specific performance levels, such as numbers of overflows per year, but instead are based upon primarily cost criteria. As such, the foundation of CRW's alternative analysis is not consistent with the CSO Control Policy's requirement to consider a range of control levels based upon performance metrics, such as number of activations or percent capture. Nor is it consistent with the PCD, which states that the alternatives analysis is not intended to consider cost. It is noted that CRW has presented performance and cost information for alternatives in addition to those identified for the control objectives (for example, see Figure 8.3-2); however, in several cases the sizing of these additional measures appears to have been somewhat random.*

**Response 22:**

CRW recognizes EPA's comment on the LoC presentation but disagrees with EPA's interpretation of CRW's intent and the conclusion that the LoCs within the Plan are inconsistent with the requirements of the CSO Policy and the PCD. The PCD and the CSO policy require CRW to perform a "knee-of-the-curve" cost-performance evaluation across a full range of alternatives and CSO control levels. The cost-performance curves presented in the CBH2OPP meet this requirement, illustrating a full range of control from the existing condition through complete combined sewer overflow reduction (through sewer separation). Further, a graphical representation of the range of CSO frequency and duration is presented for each planning area and each control strategy.

The LoC's presented on the curves are intended to facilitate comparisons of cost-effectiveness among the alternative control strategies and provide insight into appropriate implementation phasing. The performance cost evaluation was not limited by the LoCs or developed around these control levels. Instead these were used to identify various economic and performance thresholds along the curves. They are not intended to represent proposed CSO control "end points."

LoCs beyond 85 percent capture may be necessary for some CSOs to meet water quality objectives for designated uses but were not illustrated in the CBH2OPP because of CRW's decision to focus on

the immediate and near-term implementation phases, defined as what CRW could afford to invest within the first 20 years. Potential investments for the mid-term and long-term implementation phases (beyond year 20) can be derived from the cost-effectiveness curves as well:

- Table A provides the required percentage of impervious area directed to decentralized green-grey stormwater controls (the recommended alternative) to achieve a range of CSO capture and overflow frequency for each planning area. Color-coding of this table indicates that CRW's Community Greening Plan identified control of approximately 320 acres (21 percent) of the impervious area as a high-potential for implementation of green stormwater infrastructure, and control of another 630 to 850 acres (40 to 55 percent) of impervious area as a moderate potential for green stormwater infrastructure implementation. The higher end of the moderate potential requires more street and right-of-way retrofits to manage runoff from more impervious area.

**Table A: Percent of Impervious Area Directed to Decentralized Green-Grey Stormwater Controls to Achieve Given Level of Control**

Planning Area	Impervious Area	No CSOs: 99% of Typical Year <sup>1</sup>	85% Capture during Typical Year	20 overflows/year	4 Overflows/year
Riverside	54	Baseline	0% - 10%	0% - 10%	80% - 90%
Uptown	246	20% - 30%	30% - 40%	60% - 70%	90% - 100% +
Middle Front Street	131	Baseline	0% - 10%	10% - 20%	80% - 90%
Lower Front Street	59	Baseline	10% - 20%	20% - 30%	80% - 90%
Upper Paxton Creek West	161	Baseline	0% - 10%	10% - 20%	80% - 90%
Upper Paxton Creek East	28	Baseline	20% - 30%	Baseline	80% - 90%
Middle Paxton Creek West	97	0% - 10%	0% - 10%	20% - 30%	90% - 100% +
Middle Paxton Creek East	201	0% - 10%	20% - 30%	30% - 40%	90% - 100% +
Lower Paxton Creek	509	50% - 60% <sup>2</sup>	40% - 50% <sup>2</sup>	70% - 80% <sup>2</sup>	90% - 100% +
Hemlock Street	68	Baseline	0% - 10%	20% - 30%	80% - 90%
<b>System Total</b>	<b>1556</b>	<b>15% - 25%</b>	<b>20% - 30%</b>	<b>45% - 55%</b>	<b>90% - 100% +</b>

GSI Ease of Implementation from Community Greening Plan
<b>High:</b> Value less than or equal to High Potential GSI drainage area identified
<b>Moderate-High:</b> Value greater than all High Potential GSI drainage area and less than or equal to Moderate Potential GSI drainage area
<b>Moderate:</b> Value greater than all Moderate Potential GSI drainage area and less than or equal to High plus Moderate Potential GSI drainage area
<b>Moderate-Low:</b> Value greater than all Moderate Potential GSI drainage area and less than or equal to High plus Moderate Potential GSI drainage area and includes and requires greater street/right-of-way retrofits
<b>Low:</b> Value greater than sum of High plus Moderate Potential GSI area

Notes: 100% + indicates additional infrastructure needed to achieve LoC for this Catchment

Decentralized Green-Grey Stormwater Controls sized to capture 1.5 inches of runoff and infiltrate it and/or release slowly to combined sewer system

<sup>1</sup> Assumes that a total CSO duration of less than 88 hours during typical year would meet water quality criteria at least 99% of time, Per Pa Code Chapter 96.3.

<sup>2</sup> Includes some stormwater management of separate storm sewers in S-048, as described in Attachment Table 4.

Table B provides the cost associated with each control level at each Planning Area. The cost of recommended baseline improvements to the conveyance system and AWTF is also included. While this table focuses on the cost to implement the recommended alternative (the decentralized green-grey stormwater control strategy), review of the cost-performance curves in the CBH2OPP indicate that the cost to implement other local control strategies (i.e., partial separation and satellite storage/treatment) also lie in these ranges.

**Table B: Estimated Cost to Achieve Given Level of Control Under the Decentralized Green-Grey Stormwater Control Strategy**

Planning Area	No CSOs 99% of Typical Year <sup>1</sup>	85% Capture during Typical Year	20 overflows/year	4 Overflows/year
Baseline Improvements to Conveyance System/AWTF	\$36.8M - \$78.8M	\$36.8M - \$78.8M	\$36.8M - \$78.8M	\$36.8M - \$78.8M
Riverside	\$0.0M	\$3.1M - \$6.7M	\$4M - \$8.5M	\$18.5M - \$39.7M
Uptown	\$29.2M - \$62.6M	\$45.5M - \$97.5M	\$70M - \$150M	\$93M - \$199M
Middle Front Street	\$0.0M	\$6.8M - \$14.6M	\$11.3M - \$24.2M	\$44M - \$94.3M
Lower Front Street	\$0.0M	\$6.2M - \$13.4M	\$7.9M - \$17M	\$19.5M - \$41.8M
Upper Paxton Creek West	\$0.0M	\$10.4M - \$22.2M	\$18.8M - \$40.3M	\$57M - \$121M
Upper Paxton Creek East	\$0.0M	\$4M - \$8.5M	\$0.0M	\$9.4M - \$20.2M
Middle Paxton Creek West	\$0.0M	\$8M - \$17.1M	\$15.6M - \$33.4M	\$33M - \$70M
Middle Paxton Creek East	\$0.0M	\$24.9M - \$53.4M	\$34.7M - \$74.3M	\$79M - \$170M
Lower Paxton Creek	\$115M - \$247M	\$104M - \$224M	\$161M - \$346M	\$196M - \$420M
Hemlock Street	\$0.0M	\$4.4M - \$9.5M	\$9.3M - \$20M	\$23.5M - \$50.3M
<b>System Total</b>	<b>\$181M - \$388.4M</b>	<b>\$250M - \$550M</b>	<b>\$370M - \$800M</b>	<b>\$610M - \$1,300M</b>

Notes: 100% + indicates additional infrastructure needed to achieve LoC for this Catchment

Decentralized Green-Grey Stormwater Controls sized to capture 1.5 inches of runoff and infiltrate it and/or release slowly to combined sewer system

Cost of decentralized green-grey stormwater controls presented with a +50/- 30% range to represent site-specific uncertainty

<sup>1</sup> Assumes that a total CSO duration of less than 88 hours during typical year would meet water quality criteria at least 99% of time, Per Pa Code Chapter 96.3.

The range of LoCs depicted in the Tables include capture percentages and annual overflow frequencies/durations spanning a range of control necessary to meet water quality objectives for various designated uses. Under the adaptive management approach CRW will work with DEP to

assess receiving water quality conditions, clarify site-specific water quality objectives, and define the specific LoC for CSOs, MS4s, and other pollutant sources necessary to achieve these objectives.

**Comment 23:**

*Section 8 presents cost estimates for both systemwide and Planning Area-specific controls and utilizes those costs to assess the affordability of various LoCs. These costs appear to be based largely upon the City of Philadelphia's 2009 cost document, except for GI costs that were based upon a later Philadelphia document." CRW notes that costs were updated using the Engineering News Record Construction Cost Index and adjusted to the Harrisburg area using the RS Mean factor for Harrisburg. Costs for certain technologies are inflated, for example, storage basins are costed on a per-unit basis. CRW must provide additional detailed breakdowns regarding the systemwide and Planning Area alternatives cost estimates.*

**Response 23:**

The Section 8 cost-performance curves were developed by defining site-specific alternatives, their estimated construction costs, and projected CSO performance. In general, these are the "points" itemized on each cost-performance curve. The "lines" connecting these "points" allow costs to be extrapolated across a range of CSO performance levels, supporting the cost-performance evaluation of alternative control strategies required by the partial Consent Decree. A representative set of more detailed cost summaries for select "points" along the cost-performance curves are provided in Attachment Figures 2, 3 and 4 illustrate how the cost-performance evaluation reflects "real-world" conditions in Harrisburg.

**Comment 24:**

*Section 8.3.1 presents the results for CRW's first of two systemwide control strategies. The first strategy is based upon increasing conveyance and treatment capacity at the AWTF. One alternative that should be evaluated is treatment capacity at the third control point (see Section 8.3.1.1). This strategy would double total system conveyance and treatment (through primary treatment) capacity to 240 million gallons per day (MGD). It would result in an 86% capture, as well as CSO activations ranging from 0 to a maximum of 15 times in the typical year. The opinion of probable present value cost for this option is \$431 million. CRW must provide a more detailed breakdown of this cost opinion, as it is assumed that it achieves the addition of primary capacity via conventional primary clarifiers. Substitution of either an earthen storage basin or an alternative treatment technology (such as cloth media disk filters) should be considered, as it might allow for a meaningful reduction in cost at the same performance level point.*

**Response 24:**

The alternative identified in the comment is comprised of parallel interceptors/conveyance piping, expanded pump stations, and high rate weather treatment at a centralized location. A range of treatment technologies was considered in preparation of the alternative, but it was found that the conveyance of wet weather flows to a centralized treatment facility (at the AWTF or similar location) was the significant cost driver – nearly 90% of the alternative cost (outside of baseline system

improvements). More detailed cost estimates for this alternative are provided (see Attachment Figure 3).

**Comment 25:**

*Section 8.3.2 presents the results for CRW's second of two systemwide control strategies. The second strategy is based upon deep tunnel storage/conveyance. Only two tunnel lengths were examined (30,000 feet and 45,000 feet) and two diameters considered (10 foot and 15 foot). Tunnel volumes ranged from 14 MG to 64 MG. Additional options, including a hybrid option that combines a single tunnel with other controls, or shorter storage tunnels that target a limited number of the largest CSOs (such as CSOs 8, 9, 50, 51, and 48), should be considered.*

**Response 25:**

See response to Comment 5.

**Comment 26a:**

*Section 8.4 presents the localized control strategy results, with those for each Planning Area presented in a separate section.*

*a) In each Planning Area section, CRW summarizes the Baseline LoC Improvements to be implemented with the planning area (e.g., Table 8.4.1-2 for Riverside). These tables provide estimated unit baseline implementation costs in \$/1,000 MG (presumably that is \$/1,000 MG/typical year). It appears that only the in-area specific costs are included in these tables (one of which is presented in each Planning Area section), but not the apportioned collection system and AWTF costs. Later in each section, CRW notes how those area-specific costs are included in that area's apportioned piece of the overall Baseline LoC cost. CRW must provide a summary table for each of the four LoC's illustrating how the Planning Area costs for each LoC "fit" together.*

**Response 26a:**

Attachment Table 5 compare the cost-performance of the two systemwide and three local control strategies evaluated under the CBH2OPP. In general, this figure and this table demonstrate that the cost-performance of two local control strategies (i.e., decentralized green-grey stormwater control and satellite storage-treatment) is largely equivalent to the systemwide conveyance-treatment strategy. Note that findings vary somewhat by planning area but are generally consistent with this systemwide depiction.

While the cost-performance of these three control strategies are similar with respect to CSO control, the triple-bottom line alternative evaluation summarized at the end of Section 8 of the CBH2OPP found that the decentralized green-grey stormwater control strategy provides unique additional benefits, leading to its recommendation:

- It is the only control strategy where a single facility is able to control both CSOs and unauthorized releases.

- It can be implemented more cost-effectively where opportunities exist to integrate stormwater controls into sewer rehabilitation and/or land development projects.
- It provides community revitalization benefits to CRW rate payers that no other control alternative provides.
- It presents opportunities for cost-sharing, reducing the burden of CSO control on CRW rate-payers.

**Comment 26b:**

*b) Areas of opportunity for GI are identified on maps of each CSO Planning Area. Estimated costs are provided for each Planning Area for CRW's "Baseline," "Affordable," and "Presumptive" LoCs. CRW must provide additional information regarding the GI assumptions (such as type(s) of GI assumed and the general design characteristics of each type of GI) used in each Planning Area to generate these costs.*

**Response 26b:**

The cost estimates utilized from Philadelphia Water Department (PWD) documentation provide planning-level opinions of the probable cost (i.e., 50 percent to 30 percent) to install GSI sized to manage 1 to 2 inches of stormwater runoff. Additional costs were added to incorporate control of unauthorized releases during larger design storm events. The PWD analyses encompass a wide range of GSI technologies, including rain gardens/bioswales, sidewalk planters/curb bump-outs, tree trenches, permeable pavement, and infiltration storage trenches, as well as account for likely installation costs in densely developed urban areas. Detailed assumptions of GSI types were not necessary to derive planning level cost estimates, and would require site-specific, design level information. However, the CBH2OPP provides adequate detail to determine if sufficient levels of GSI opportunity exist in planning areas identified in the selected alternative. CRW utilized the Community Greening Plan analyses to make this determination, which is summarized by planning area in the CBH2OPP (see response to Comment 22 for additional details).

**Comment 26c:**

*c) Table 8.4.1- 2 and the equivalent tables in the other Planning Area sections illustrate how CRW's Baseline LoC does not achieve a consistent percent capture or activation frequency across the individual CSOs within a given Planning Area.*

*In the case of Riverside, CSO S-004 achieves a capture of 84% and 24 activations, while CSO S-005 achieves an 87% capture and 16 overflows. At the Baseline LoC, the most frequent activation in each CSO Planning Area is as follows:*

- *Riverside — 24/typical year (CSO-004)*
- *Uptown — 51/typical year (CSO-010 & CSO-011)*
- *Middle Front Street — 34/typical year (CSO-052)*
- *Lower Front Street — 39/typical year (CSO-057)*

- Upper Paxton Creek West — 30/typical year (CSO-027 & CSO-028)
- Upper Paxton Creek East — 15/typical year (CSO-026)
- Middle Paxton Creek West — 57/typical year (CSO-032)
- Middle Paxton Creek East — 41/typical year (CSO-034)
- Lower Paxton Creek — 55/typical year (CSO-048)
- Hemlock Street — 34/typical year (CSO-060)

*CRW provides an average activation frequency, in the case of the Riverside Planning Area 20 activations per typical year. However, an average activation frequency is not a useful metric. The activation rate for a waterbody or a portion of a waterbody is the number of times one or more CSOs activate.*

*CRW does discuss the possibility of implementing additional measures in many of the Planning Areas (see further discussion below). However, given the likely limited magnitude of such additional measures and the lack of certainty regarding their implementation, it appears that the activation frequencies predicted for the Baseline LoC are least representative of what might be achieved by CRW's proposed Plan. CRW should re-evaluate its activation frequencies.*

#### **Response 26c:**

CRW does consider CSO activation frequencies and durations critical parameters for defining ultimate CSO control targets under its adaptive management approach:

- As expressed in our response to Comment 22, CRW used these levels of control and average planning area statistics to prioritize actions in the immediate and near-term implementation periods, not to preclude additional control during the less-well-defined mid-term and long-term implementation periods beyond year 20. The CBH2OPP also presents CSO performance statistics at each CSO as well as planning area averages to assist with implementation decisions.
- While CSO event frequency and duration statistics for each individual outfall were provided in Section 8 of the report, CRW does not agree with EPA's statement that "an average activation frequency is not a useful metric." Receiving water impacts should be evaluated on a reach-by-reach basis, particularly in the case of CRW's system where many CSOs are closely clustered. CRW defined planning areas with receiving water quality evaluation in mind and believes that a range of CSO performance statistics (e.g., volume, duration, frequency, load) all come into play when evaluating water quality impacts. The CBH2OPP presents all these statistics to assist in the evaluation and will use them to support program phasing and implementation under an adaptive management approach.
- CRW also does not agree with EPA's statement that "the likely limited magnitude of such additional measures and the lack of certainty regarding their implementation" will limit CSO control levels. CRW fully intends to continue implementation of decentralized green-grey stormwater controls beyond the 20-year immediate and near-term implementation phases,

with a goal of meeting water quality objectives for designated uses (see response to Comment 22). Under the adaptive management approach, CRW will also evaluate its effectiveness in implementing this decentralized green-grey stormwater control strategy (particularly with respect to shared implementation with land developers, property owners, and other stakeholders), and will re-evaluate (and potentially revise) its preferred control strategy based upon performance trends.

**Comment 26d:**

*d) In each Planning Area, CRW considered three Local Control Strategies:*

- *Local Control Strategy 1: Decentralized GI and/or Grey Infrastructure Controls*
- *Local Control Strategy 2: Satellite Storage and/or Treatment*
- *Local Control Strategy 3: Combined Sewer Separation*

*If a given Planning Area achieved an average Presumptive LoC of 85% by implementation of the Baseline LoC, CRW generally determined that additional CSO control was a low priority within the proposed 20-year planning horizon, especially since two of the CSO catchment areas are predicted to remain very active. This is inappropriate given bacteria as a pollutant of concern in both direct receiving waters and the 1994 CSO Control Policy requires the presumption be reasonable that 85% capture will result in meeting the water quality-based requirements of the CWA.*

**Response 26d:**

CRW's CBH2OPP is an integrated municipal stormwater and wastewater plan that addresses CSOs, SSOs, MS4s, TMDLs, unauthorized releases, and other sources of water quality impairment in a prioritized manner, described as follows:

- In the planning areas where the CBH2OPP identified lower CSO performance following implementation of baseline controls, CRW has set specific targets for priority implementation of decentralized green-grey stormwater controls during the immediate and near-term implementation phases.
- In remaining planning areas, critical sewer rehabilitation and/or redevelopment projects would be combined and integrated with green/grey stormwater controls wherever feasible and able to provide cost-effective wet weather control.

The adaptive management approach will use available information to periodically evaluate implementation opportunities and revise implementation priorities, seeking to maximize cost effective opportunities as described in Chapter 11 (See also the response to Comments 13, 14, 15, and 22).

**Comment 26e:**

- e) *In several Planning Areas, CRW identifies "minimum feasible" sizes for high rate treatment or storage facilities. CRW does not adequately explain why the identified sizes are the minimum sizes that are "feasible," and must do so.*

**Response 26e:**

Minimum feasible sizes for satellite high rate treatment and storage facilities are driven by many factors such as: technology limitations (minimum flow rates for sufficient treatment), facility siting and location feasibility, facility depths below ground surface, and changes in hydraulic conditions for given typical year rainfall patterns and control alternatives (baseline improvements increase high flow durations in the interceptors). Further, CRW's interceptors are located in highly constrained areas: the Front Street Interceptor parallels the Susquehanna River and properties along Front St while the Paxton Creek Interceptor parallels Paxton Creeks' concrete channel, often below/adjacent to existing surface structures. These constraints limit potential facility sites, as discussed in the response to Comment 23. CRW utilized the Baseline Level of Control performance to identify areas where satellite facilities would be most cost-effective at reducing combined sewer overflows and where possible attempted to prepare alternatives that consolidated multiple combined sewer overflow points.

Consolidation was often necessary with the many small CSO catchments in CRW's combined sewer system to achieve minimum flow rates for high rate treatment facilities. Satellite high rate treatment was considered in all areas to identify alternatives to achieve higher levels of CSO capture with sizes identified to achieve given CSO activation frequencies (20, 10, 4, or 0 overflows). Since individual CSO performance is determined by several factors, the minimum size in individual planning areas will vary to achieve those CSO activation frequencies. Satellite storage facilities were considered where CSO performance was relatively poor since satellite high rate treatment facilities are less feasible at lower flow rates and storage can be cost effective at reducing CSO from small rainfall events.

**Comment 26f:**

- f) *Section 8.4.15 discusses the separate Spring Creek Planning Area. The Plan notes that "approximately 94% of the tributary area and over 90% of the dry and wet weather flows into and through CRW's Spring Creek Interceptor" are generated by CRW's wholesale customers. The Plan notes that both the Spring Creek Interceptor capacity and Spring Creek Pump Station capacity are exceeded in the 2-year storm event and that SSOs are predicted to occur. CRW must provide additional information regarding the magnitude of the flows from this interceptor during the typical year to provide a better understanding of the degree to which wet weather flows from the wholesale customers impact the combined sewer system's typical year performance.*

**Response 26f:**

Wholesale customer flow during wet weather periods is up to 80% of the wet weather volume discharged from the Spring Creek pump station to the AWTF, however the planned Spring Creek

Pump Station capacity is greater than the sum of the incoming peak flows from the Spring Creek Interceptor and the Hemlock Creek Interceptor during the typical year. Attachment Figure 5 provides hydrographs of the incoming flows (Hemlock Street Interceptor and Spring Creek Interceptor) to the Spring Creek Pump Station and outgoing flow from the Spring Creek Pump Station for the typical year peak flow event from Spring Creek Pump Station. This event figure shows the sum of the incoming flows (Hemlock Street Interceptor and Spring Creek Interceptor Wholesale and CRW inflows) and the outflow (Spring Creek Pump Station) do not exceed the pump station capacity during this event. The examples suggest that Spring Creek Interceptor is not limiting capture of combined sewage from the Hemlock Creek Interceptor and through the Spring Creek Pump Station, rather Hemlock Street Interceptor system combined sewer flows to the pump station are limited by the hydraulic capacity of the regulator connections and interceptor. However, it should be noted the baseline level of control for the Hemlock Street Interceptor system provides 85% capture of combined sewage volume for this portion of the combined sewer system.

**Comment 27:**

*Section 8.5.1 describes CRW's analysis of alternatives for bypassing at its AWTF. CRW should also consider approaches to provide a higher level of treatment to these bypasses. Such treatment improvements may include the addition of chemical enhancement to the existing primaries or a parallel enhanced sedimentation or filtration technology. Also, CRW must provide an analysis of expanding treatment through the secondary treatment beyond the current 45 MGD.*

**Response 27:**

CRW's AWTF already has chemically enhanced primary treatment as part of the recent upgrade, which will be implemented and tested in conjunction with ongoing upgrades to improve performance (baffles and inlet modifications) in the primary clarifiers up to 80 mgd.

CRW recently upgraded the secondary treatment process to 45 mgd, as described in the CBH2OPP. The secondary improvements were designed to maximize process treatment within the physical constraints of the existing facility. There is not sufficient space at the site to expand the secondary treatment facilities, and the existing facilities are hydraulically limited to 45 mgd. Alternate technologies were not evaluated since the AWTF upgrade was just recently completed.

**Comment 28:**

*Section 9 describes CRW's proposed approach to Plan implementation via an adaptive management strategy. This strategy would rely on two "evaluate and adapt" points within the 20-year planning horizon: one at year 10 and another at year 15. This section needs to be expanded and include discussion of the role of EPA and PADEP in the process, as well as consider adding an evaluate and adapt point at year five.*

**Response 28:**

See response to Comment 7.

**Comment 29:**

*Section 9.2.2.1 discusses pilot and demonstration projects. CRW discusses these projects in a general, and limited information is provided about these projects. CRW mentions that one (of seven) identified pilot project involves the installation of GI in four local parks, but does not discuss this idea any further. CRW needs to provide more detailed information regarding all seven pilot projects.*

**Response 29:**

Please see the Attachment Table 3 summarizing GSI projects to be implemented, their estimated construction cost, the projected project completion date, and the corresponding wet weather control benefits. Four (4) GSI projects are being completed in 2018 and six (6) additional projects are slated for construction in 2019. These projects will provide stormwater control for 14-acres of impervious area.

**Comment 30:**

*Section 9.2.2.3 discusses development-driven source control opportunities. CRW discussed possible future stormwater regulations, and CRW must provide information on whether adoption of such regulations is likely, and if so, the expected timeline for adoption.*

**Response 30:**

As noted in our most recent Semi-Annual Report, existing legal authority is adequate for current regulatory requirements. Capital Region Water reviews all Land Development projects in coordination with the City of Harrisburg and provides final approval for all Stormwater Management Plans. During the Land Development process Capital Region Water works closely with willing Developers and their Engineers to advance stormwater management plans to achieve additional capture or manage peak flows with cost neutral strategies like adjustments to outlet control structures.

Enactment of integrated wastewater/ stormwater regulations to support future regulatory requirements, policy initiatives, and refine our role in land development is anticipated during 2019. Furthermore, it is Capital Region Water's intention to roll out the modified regulations in concert with incentive-driven program components like stormwater credits and/or funding incentives, and incorporate those elements into the regulations.

**Comment 31a:**

*Section 10 presents CRW's Post-Construction Monitoring Plan (PCMP). CRW proposes a two-part PCMP. The first part of the PCMP process will involve annual monitoring to gauge progress and impacts, with the results of that monitoring reported in the annual Chapter 94 reports. The second part of the PCMP process involves a more comprehensive monitoring effort at approximately year 10. CRW will submit the results of this year 10 monitoring effort, presumably to both EPA and PADEP. CRW must address the comments in items a — e below.*

- a) *The PCMP does not contemplate detailed monitoring or reporting at the end of the proposed 20-year planning horizon, as it should.*

**Response 31a:**

Post-construction monitoring was not proposed in implementation Year 20 because CRW does not consider Year 20 to be the end-point of its CSO control program. Under the adaptive management approach, a comprehensive post-construction monitoring time frame and approach will be recommended when the level of control appears to be successfully approaching water quality objectives for designated uses.

As stated later in EPA's review comments, the majority of the costs, improvements, control facilities, and benefits of the proposed Plan are implemented within the first 10 years, identified as the immediate implementation phase within the Plan narrative. The monitoring effort implemented after year 10 is to quantify system flows and CSO discharge frequencies at selected representative outfalls in order to revalidate the hydraulic and hydrologic (H&H) model, and use this model to verify that predicted CSO capture volumes are achieved.

The proposed level of monitoring included in the Plan is expected to continue well after year 20. The existing network of permanent monitoring sites along the interceptor system and at the major points of connection with the suburban community sewer systems will be maintained through the proposed 20-year planning horizon. Similarly, flow monitoring at the pump stations and at the AWTF will continue. The network of precipitation gauges and the Gauge Adjusted Radar Rainfall (GARR) will also be maintained. The data collected from these monitor sites will be integrated into the H&H model simulations used to calculate annual CSO discharge frequencies and volumes to meet NPDES permit and PCD reporting requirements. As part of an ongoing model verification process the interceptor and municipal connection flows and the CSO statistics calculated by H&H model will be checked against those monitored in the field and those reported by daily CRW field staff inspections.

**Comment 31b:**

- b) *The PCMP does not identify what performance criteria will be used to assess compliance; however, Section 11 indicates that percent capture will be the "primary metric for compliance." The 1994 CSO Control Policy requires that a post construction water monitoring program be adequate to verify compliance with water quality standards and protection of designated uses as well as to ascertain the effectiveness of CSO controls.*

**Response 31b:**

See response to Comment 31a. It is not expected that the system improvements and control measures included in the immediate and near-term implementation phases of the Plan (i.e., through year 20) will be sufficient to meet water quality objectives for designated uses. A comprehensive water quality monitoring program, implemented in conjunction with DEP monitoring programs, will be implemented after future Plan phases.

**Comment 31c:**

- c) The Plan contemplates limited flow monitoring to support model validation/recalibration, but must include more.*

**Response 31c:**

CRW respectfully disagrees with the assertion that the proposed level of monitoring effort is insufficient to meet the goals and objectives for this phase of post construction monitoring. The comment did not indicate what areas or monitoring categories were deficient, making it difficult to address the alleged deficiencies. The response to comment 31a makes it clear that the currently proposed level of monitoring activities is sufficient to revalidate the H&H model to reflect system conveyance improvements and implemented control facilities.

**Comment 31d:**

- d) The Plan mentions model validation, but does not adequately discuss what will constitute validation, such as demonstration of a degree of calibration at least as good as achieved prior to use of the model to support LTCP development.*

**Response 31d:**

Specific requirements for model revalidation are the same as the criteria used for original model calibration/validation. These criteria are described in CRW's previously submitted Sewer System H&H Model Report to EPA/DEP that was subsequently accepted by the agencies. Those same criteria will be used to support revalidation of the refined H&H model.

**Comment 31e:**

- e) The Plan states that water quality monitoring will be carried out by "partnering with PADEP." Such a statement could be interpreted as meaning that absent such "partnering" no water quality monitoring will be carried out. The 1994 CSO Control Policy specifically requires the permittee to conduct water quality monitoring to ensure compliance with water quality standards.*

**Response 31e:**

See response to comment 13.

**Comment 32:**

*Section 11 summarizes the Recommended Plan and Implementation Schedule.*

- a) The Recommended Plan Overview (Section 11.1) focuses on the amounts of money CRW is willing to expend ("up to \$113 million...for priority projects...") rather than committing to the implementation of specific projects that will meet the requirements of the PCD or the 1994 CSO Control Policy and is thus not consistent with the PCD or 1994 CSO Control Policy. The LTCP must be revised to correct this.*

**Response 32a:**

Attachment Tables 1 through 4 to this response letter identify specific projects to be implemented during the immediate implementation phase, their estimated construction cost, the projected project completion date, and the corresponding wet weather control benefits. Table 1 provides project information for planned improvements to the AWTF. Table 2 provides project information for planned capital improvements to the conveyance system. Table 3 provides project information for CRW collection system GSI projects. Table 4 provides project information for multi-objective CRW collection system projects, identified through CCTV inspections to date, that are expected to rehabilitate structural deterioration AND integrate stormwater controls that reduce CSOs and unauthorized releases.

- b) *Because of the amount of resources CRW proposes to dedicate to system rehabilitation, CSO capture will increase to only 79% by year 10, and then only another 1% in the following ten years (see Figure 11-1). CRW must re-evaluate its resources and how they are applied to CSO capture.*

**Response 32b:**

As was explained in the response to Comment 10, a baseline level of control consisting of a variety of system renewal and enhancement projects was prioritized for implementation during the immediate implementation phase (initial 10 years) of the CBH2OPP to achieve multiple objectives:

- Increase the hydraulic conveyance capacity of existing regulators, pump stations, and AWTF headworks/primary clarifiers to the full hydraulic conveyance capacity of existing interceptors, increasing CSO capture from 53 percent to 79 percent during the typical year.
- Stabilize and strengthen existing interceptor, pump station, and AWTF structures and mechanical equipment to withstand increased periods of high flow and surcharging during high wet weather flow conditions

Implementation of these “baseline” improvements consumes all of CRW’s bonding capacity and most of its financial capability by Year 8, according to the current FCA, resulting in limited funding for projects during the near-term implementation phase (i.e. years 11 through 20). Remaining financial capacity during this period is targeted at a cost-effective blend of collection system renewal and wet weather control under the recommended alternative, the decentralize green-grey stormwater control strategy. Because the cost of collection system renewal cannot be estimated until comprehensive CCTV inspections are completed, the recommended implementation approach focused on integrated system renewal/stormwater control projects to increase their cost-effectiveness. Attachment Table 4 identifies such multi-objective projects, which have been identified through initial CCTV inspections since the CBH2OPP was submitted. Additional projects will be identified and prioritized through the adaptive management process.

Future phases of multi-objective collection system renewal/decentralized green-grey stormwater control projects are envisioned beyond year 20, as necessary to meet water quality objectives. Future FCA revisions are expected to identify additional funding to support such projects. The



adaptive management process may also identify opportunities for additional CSO control projects should actual estimated costs be higher than actual implementation costs.

c) *Sections 11.5.1 and 11.5.3 summarize CRW's proposed remedial measures for the first and second 10-year periods, respectively. The descriptions provided must be revised to provide detailed design criteria to commit CRW to specific project scopes.*

**Response 32c:**

See response to Comment 32a. Attachment Tables 1 through 4 summarize the design intent and scope of these improvements. Improvements recommended for years 11 through 20 remain conceptual until CCTV inspections are performed. The design intent and scope of specific projects identified for implementation will be provided for consideration by EPA/DEP under the adaptive management approach as part of annual reports and 5-year *Adaptive Management Plan Update Reports*.

Please contact me directly to discuss any question or concerns you may have.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "David Stewart".

David Stewart, P.E., BCEE  
Director of Engineering  
Capital Region Water

cc: Michael Doweary, CRW  
Claire Maulhardt, P.L.A., CRW  
Steven Hann, Esq.  
John Aldrich, P.E., D.WRE, CDM Smith

**Attachments:**

- Attachment Table 1: *CRW Capital Improvement Projects for the AWTF*
- Attachment Table 2: *Capital Improvement Projects for the CRW Conveyance System*
- Attachment Table 3: *GSI Projects for the CRW Collection System* (Tables 1 through 3 are referenced within Cover Letter Responses 6)
- Attachment Table 4: *Rehabilitation, Separation, Storage Projects for the CRW Collection System* (Tables 1 through 4 are referenced within Cover Letter Responses 4 and 8 and Responses 10 and 32a)
- Attachment Table 5: *Systemwide and Local Control Strategy Cost Performance Comparison* (referenced within Cover Letter Response 2 and Response 23)
- Attachment Figure 1: *CRW's CSO Warning Signs* (referenced within Response 2)



- Attachment Figure 2: Additional Cost Breakdown for Systemwide Control Strategy 2 - Deep Tunnel Storage/Conveyance, Control Point 2 (referenced within Response 23)
- Attachment Figure 3: Additional Cost Breakdown for Systemwide Control Strategy 2 - Deep Tunnel Storage/Conveyance, Control Point 3 (referenced within Response 23)
- Attachment Figure 4: Additional Cost Breakdown for Uptown Satellite Storage/Treatment - CBH23OPP Figures 8.4.3-3 and 8.4.3-4 (referenced within Response 23)
- Attachment Figure 5: Spring Creek Pump Station Typical Year Peak Flow Event Hydrograph (referenced within Response 26f)

## Attachments

- Attachment Table 1: *CRW Capital Improvement Projects for the AWTF*
- Attachment Table 2: *Capital Improvement Projects for the CRW Conveyance System*
- Attachment Table 3: *GSI Projects for the CRW Collection System* (Tables 1 through 3 are referenced within Cover Letter Responses 6)
- Attachment Table 4: *Rehabilitation, Separation, Storage Projects for the CRW Collection System* (Tables 1 through 4 are referenced within Cover Letter Responses 4 and 8 and Responses 10 and 32a)
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- Attachment Figure 5: Spring Creek Pump Station Typical Year Peak Flow Event Hydrograph (referenced within Response 26f)

**Attachment Table 1: CRW Capital Improvement Projects for the AWTF\***

Project Name	Project Objectives	Estimated Construction Cost	Projected Project Completion	Wet Weather Control Benefits
Headworks Screening	<ul style="list-style-type: none"> <li>Install mechanically cleaned fine screening</li> </ul>	\$3.6M	Q4 2018	Increases hydraulic capacity to 80 MGD, with additional 40 MGD backup capacity.
Primary Digester Rehabilitation	<ul style="list-style-type: none"> <li>Replace digester covers and mixing systems, associated piping and valves</li> <li>Replace electrical controls and switchgear</li> <li>Clean and insulate digester tanks</li> </ul>	\$8.2M	Q1 2020	Restore and maximize biosolids digestion capacity Improve overall AWTF operational efficiency Maximize digester gas production potential
Primary Clarifier Improvements/Repair	<ul style="list-style-type: none"> <li>Replace clarifier sludge collection drives, chains, flights, pumps, and associated piping and valves</li> <li>Install additional baffles to reduce short circuiting and re-suspension of settled solids.</li> <li>Repair/rehabilitate concrete structure</li> </ul>	\$6M	Q4 2020	Increase hydraulic capacity to 80 MGD Improved wet weather operations allows more efficient use of chemically-enhanced settling. Improves settling/reduces re-suspension in clarifiers at 80 MGD hydraulic capacity.
Combined Heat & Power System Rehabilitation	<ul style="list-style-type: none"> <li>Replace combined heat and power system, which is beyond its useful life</li> </ul>	\$10M	Q4 2020	Restore operational efficiency to digester gas cogeneration and heating system.
Additional Solids Process Rehab/Improvements	<ul style="list-style-type: none"> <li>Equalization/ pretreatment for high strength waste</li> <li>Secondary Digesters – clean, rehab, cover replacement</li> </ul>	\$5M	Q4 2022	Restore operational efficiency to solids processes

*\*Numerous minor capital improvements are also made annually to maintain operational efficiency. Examples include pump replacement, repair to critical plant components (i.e., cogeneration and cryogenic oxygen generation systems)*

**Attachment Table 2: Capital Improvement Projects for the CRW Conveyance System**

Project Name	Project Objectives	Estimated Construction Cost	Projected Project Completion	Wet Weather Control Benefits
Paxton Creek Interceptor Rehabilitation	<ul style="list-style-type: none"> <li>Restore structural integrity of 13,500 ft. pipe.</li> </ul>	\$20M	3Q 2020	Strengthened pipe allows operation under surcharge, enabling realization of full hydraulic capacity.
Asylum Run Interceptor Rehabilitation	<ul style="list-style-type: none"> <li>Restore structural integrity of 2,500 ft. pipe.</li> </ul>	\$1.2M	4Q 2018	Strengthened pipe allows operation under surcharge, enabling realization of full hydraulic capacity.
Front St. Interceptor Rehabilitation, Ph. 1	<ul style="list-style-type: none"> <li>Restore structural integrity of 2,000 ft. pipe.</li> </ul>	\$0.6M	4Q 2018	Strengthened pipe allows operation under surcharge, enabling realization of full hydraulic capacity.
Front St. Pump Station	<ul style="list-style-type: none"> <li>Complete Pump Station Rehabilitation</li> <li>Replace pumps, screens and all associated operating equipment</li> </ul>	\$12M	2Q 2020	New pumps increase hydraulic capacity from 40 to 60 MGD,
Front St. Interceptor Rehabilitation, Ph. 2	<ul style="list-style-type: none"> <li>Restore structural integrity of 10,600 ft. pipe</li> </ul>	\$9M	4Q 2020	Strengthened pipe allows operation under surcharge, enabling realization of full hydraulic capacity.
Spring Creek Interceptor Rehabilitation	<ul style="list-style-type: none"> <li>Restore structural integrity of 5,100 ft. pipe.</li> </ul>	Joint project with Suburbs - tbd	4Q 2022	Strengthened pipe allows operation under surcharge, enabling realization of full hydraulic capacity.
Spring Creek Pump Station	<ul style="list-style-type: none"> <li>Replace Spring Creek P.S. most likely on a new site, co-located with a storage facility</li> </ul>	\$7.5M	4Q 2022	New pumps increase hydraulic capacity from 18 to 30 MGD, increasing typical year CSO capture from 53% to 78%.
CSO Regulator Enhancements	<ul style="list-style-type: none"> <li>Modify exist control orifices to maximize wet weather capture</li> <li>Restore flap gates and outfall pipes to prevent river intrusion</li> </ul>	\$2.5M	4Q 2021	Increases conveyance to interceptor, prevents backflow from interceptor in surcharge conditions, and reduces river intrusion, increasing typical year CSO capture from 53% to 78%.

**Attachment Table 3: Green Stormwater Infrastructure Projects for the CRW Collection System**

Project Name	Project Objectives	Estimated Construction Cost	Projected Project Completion	Wet Weather Control Benefits
Third St. Multi-Modal GSI	<ul style="list-style-type: none"> <li>Early action GSI demonstration project within ROW.</li> <li>Multiple rain gardens and tree trenches.</li> </ul>	\$2.8M	Q3 2019	<i>Wet Weather Control Benefit quantification is not finalized.</i>
Parks GSI – Cloverly Heights	<ul style="list-style-type: none"> <li>Demonstration porous asphalt basketball court with subsurface storage (lined – Karst)</li> <li>Rain garden demonstration with small pretreatment rain garden</li> </ul>	\$0.4M	Q3 2018	<ul style="list-style-type: none"> <li>Reduce peak flows of runoff from park and surrounding neighborhood in a separate-sewered area of the City</li> </ul>
Parks GSI – Royal Terrace	<ul style="list-style-type: none"> <li>Early action GSI demonstration project within City Park</li> <li>Demonstration porous asphalt basketball court with subsurface storage and infiltration system</li> </ul>	\$0.3M	Q3 2018	Managing runoff from 34,500 square feet drainage area. System was designed to provide 0.88 ac-in of storage below the overflow.
Parks GSI – Penn & Sayford	<ul style="list-style-type: none"> <li>Early action GSI demonstration project within City Park</li> <li>Two rain gardens</li> </ul>	\$0.1M	Q3 2018	Managing runoff from approximately 14,600 square feet drainage area. Total storage volume > 0.16 ac-in.
Parks GSI – 4 <sup>th</sup> & Dauphin	<ul style="list-style-type: none"> <li>Early action GSI demonstration project within City Park</li> </ul>	\$0.4M	Q4 2019	<i>Wet Weather Control Benefits are not finalized.</i>
Summit Terrace Neighborhood GSI	<ul style="list-style-type: none"> <li>Early action GSI demonstration project remediating and repurposing vacant lots to manage stormwater and provide neighborhood amenities.</li> </ul>	\$0.4M	Q3 2018	Manage 1.15 acres of existing impervious area resulting in approximately 950,000 gallons of stormwater capture per year.
Camp Curtain Big Green Block GSI	<ul style="list-style-type: none"> <li>Early action GSI demonstration project in partnership with community and church.</li> </ul>	\$2.1M	Q4 2019	<i>Wet Weather Control Benefits are not finalized.</i>
MulDer Square GSI	<ul style="list-style-type: none"> <li>Early action GSI demonstration project within ROW</li> </ul>	\$1M	Q4 2019	<i>Wet Weather Control Benefits are not finalized.</i>
South Allison Hill GSI	<ul style="list-style-type: none"> <li>Early action GSI demonstration project within ROW</li> </ul>	\$1.2M	Q4 2019	<i>Wet Weather Control Benefits are not finalized.</i>
2 <sup>nd</sup> St. / 7 <sup>th</sup> St. Multi-Modal GSI	<ul style="list-style-type: none"> <li>Early action GSI demonstration project within ROW</li> </ul>	\$1M	Q4 2019	<i>Wet Weather Control Benefits are not finalized.</i>
Paxton Creek Stream Restoration	<ul style="list-style-type: none"> <li>Stabilize Paxton Creek streambank, reducing sediment and nutrient loading.</li> </ul>	\$0.3M	Ongoing (likely beyond 2023)	Regional project with Lower Paxton and Susquehanna Townships achieves full Paxton Creek TMDL and initial Chesapeake Bay TMDL load reductions.
Stormwater Regulations	<ul style="list-style-type: none"> <li>Implement wet weather fee and credit structure.</li> <li>Provide enhanced wet-weather performance standards for development projects.</li> <li>Support enforcement of pollution prevention mechanisms.</li> </ul>		Ongoing	Provide a funding stream, incentives, requirements, and performance standards for proper wet weather management on property discharging to CRW's system.

**Attachment Table 4: Rehabilitation, Separation, Storage Projects for the CRW Collection System**

Project Name	Project Objectives	Estimated Construction Cost	Projected Project Completion	Wet Weather Control Benefits
Priority System Cleaning and Televising Program	<ul style="list-style-type: none"> <li>Contracted service focusing on priority sections of CRW's system that are either impractical or inefficient to self-perform</li> <li>Expedite completion of cleaning and assessment of entire system</li> </ul>	\$250,000 \$250,000 \$250,000 \$250,000 \$250,000	Q4 2018 Q4 2019 Q4 2020 Q4 2021 Q4 2022	<ul style="list-style-type: none"> <li>System assessment and prioritization</li> <li>Identification of pipe (CSS, SS and MS4) for rehabilitation and replacement to prevent failures leading to DWOs and SSOs</li> </ul>
Market Street Rehabilitation and Wet Weather Control	<ul style="list-style-type: none"> <li>Repair/replace collapsed sewer in Market St. (parallel 36-in brick lines)</li> <li>Rebuild/restore inlets</li> <li>Install decentralized green/grey stormwater controls</li> </ul>	\$1.3M  \$0.5M \$1M	Q4 2018  Q4 2019 Q4 2019	<ul style="list-style-type: none"> <li>Reduce DWOs at CSO-037 and basement backups along Market St.</li> <li>Control CSOs, basement backups, and flooding through use of GSI/restored inlets to manage stormwater at the source and reduce volumes/peaks entering CRWs system.</li> </ul>
System-wide Pipe Rehabilitation and replacement	<ul style="list-style-type: none"> <li>Repair and replacement of failing pipe, manhole, inlet and associated infrastructure</li> </ul>	\$1.4M \$2.5M \$2.5M \$2.5M \$2.5M	Q4 2018 Q4 2019 Q4 2020 Q4 2021 Q4 2022	<ul style="list-style-type: none"> <li></li> </ul>
CSO-048 (Mish Run, Bellevue Park) Separation and Wet Weather Control	<ul style="list-style-type: none"> <li>Install decentralized green/grey stormwater controls.</li> <li>New separate trunk storm sewer to connect existing separate storm sewers to Paxton Creek.</li> </ul>	\$18M**	Q4 2022	<ul style="list-style-type: none"> <li>Redirect 118 acres of separate storm sewers out of CSO 048 combined sewers, reducing 90 MG of CSO volume during typical year.</li> <li>Control peak flows/volumes to minimize trunk storm sewer size.</li> <li>Reduce stormwater pollution/ volumes.</li> </ul>

**\*\* Cost of separation only. Does not include cost to attenuate and treat (\$60-\$100M additional)**

**Attachment Table 5: Systemwide and Local Control Strategy Cost Performance Comparison**

Alternative Strategy	Level of Control							
	Existing		Baseline		Affordable		Presumptive	
	Cost (\$M)	Capture (%)	Cost <sup>1,2</sup> (\$M)	Capture (%)	Cost (\$M)	Capture <sup>3</sup> (%)	Cost <sup>1,2</sup> (\$M)	Capture (%)
Systemwide Control Strategy 1 - Increased Conveyance and Treatment	\$0	53%	\$115 - \$250	79%	\$270	80-81%	\$350 - \$750	85%
Systemwide Control Strategy 2 - Deep Tunnel Storage	\$0	53%	\$115 - \$250	79%	n/a	n/a	n/a	n/a
Local Control Strategy 1 - Decentralized Stormwater Management	\$0	53%	\$115 - \$250	79%	\$270	80-81%	\$220 - \$470	85%
Local Control Strategy 2 - Satellite Treatment and/or Storage Facilities	\$0	53%	\$115 - \$250	79%	\$270	82-83%	\$190 - \$400	85%
Local Control Strategy 3 - Sewer Separation	\$0	53%	\$115 - \$250	79%	\$270	80-81%	\$420 - \$900	85%

<sup>1</sup> – Total Probable Cost, Present Value of Capital and Operations & Maintenance Costs

<sup>2</sup> – Total Probable Cost range for planning is +50%/-30%

<sup>3</sup> – Approximate Percent Combined Sewer System Capture near the Affordable Level of Control

Attachment Figure 1: CRW's CSO Warning Signs

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# WARNING

## PRECAUCIÓN

### COMBINED SEWER OVERFLOW AREA

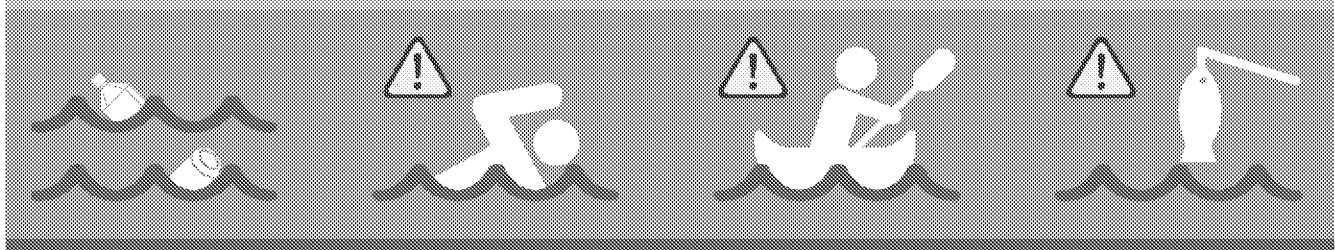
DESBORDAMIENTO DEL SISTEMA DE ALCANTARILLADO COMBINADO AREA

**RAINWATER MIXED WITH UNTREATED SEWAGE CONTAINING HARMFUL BACTERIA MAY DISCHARGE DURING AND FOLLOWING RAINFALL EVENTS.**

**EL AGUA DE LLUVIA MEZCLADA CON AGUAS RESIDUALES NO TRATADAS QUE CONTIENEN BACTERIAS DANINAS PUEDE DESCARGARSE DURANTE Y DESPUÉS DE LOS EVENTOS DE LLUVIA.**

**AVOID CONTACT WITH WATER DURING AND FOLLOWING RAINFALL EVENTS**

**EVITE EL CONTACTO CON EL AGUA DURANTE Y DESPUÉS DE LAS PRECIPITACIONES PLUVIALES**



Learn More / Aprenda Más @ [CapitalRegionWater.com/cbh2o](http://CapitalRegionWater.com/cbh2o)

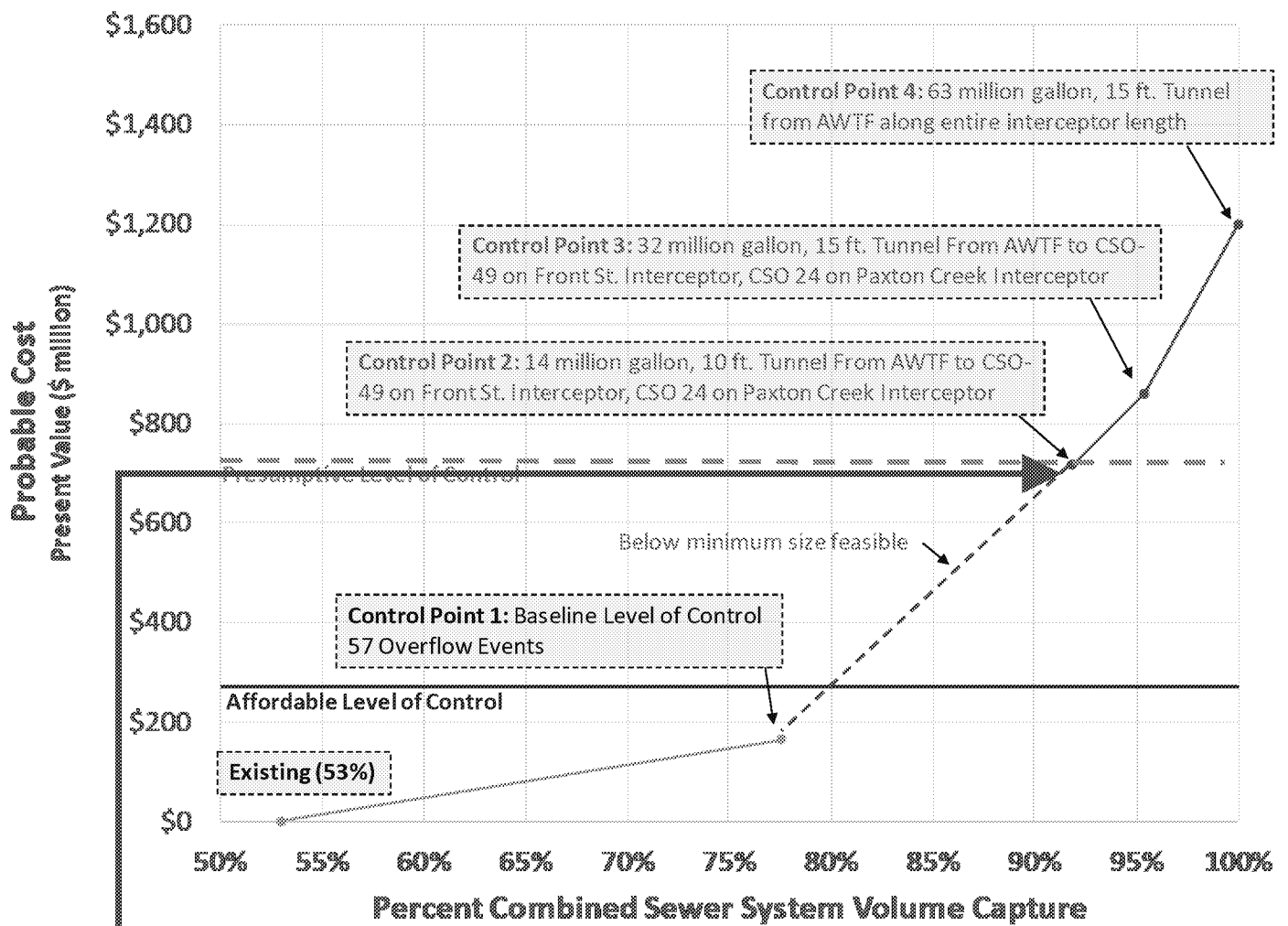


*Call 888-510-0606 to check on the status of combined sewer overflows.  
Llame al 888-510-0606 para verificar el estado de los desbordamientos combinados de alcantarillas.*

*If you see an overflow during dry weather, please call Capital Region Water 888-510-0606  
Si es testigo de un desbordamiento durante la temporada de sequía, repórtelo por favor a Capital Region Water 888-510-0606*



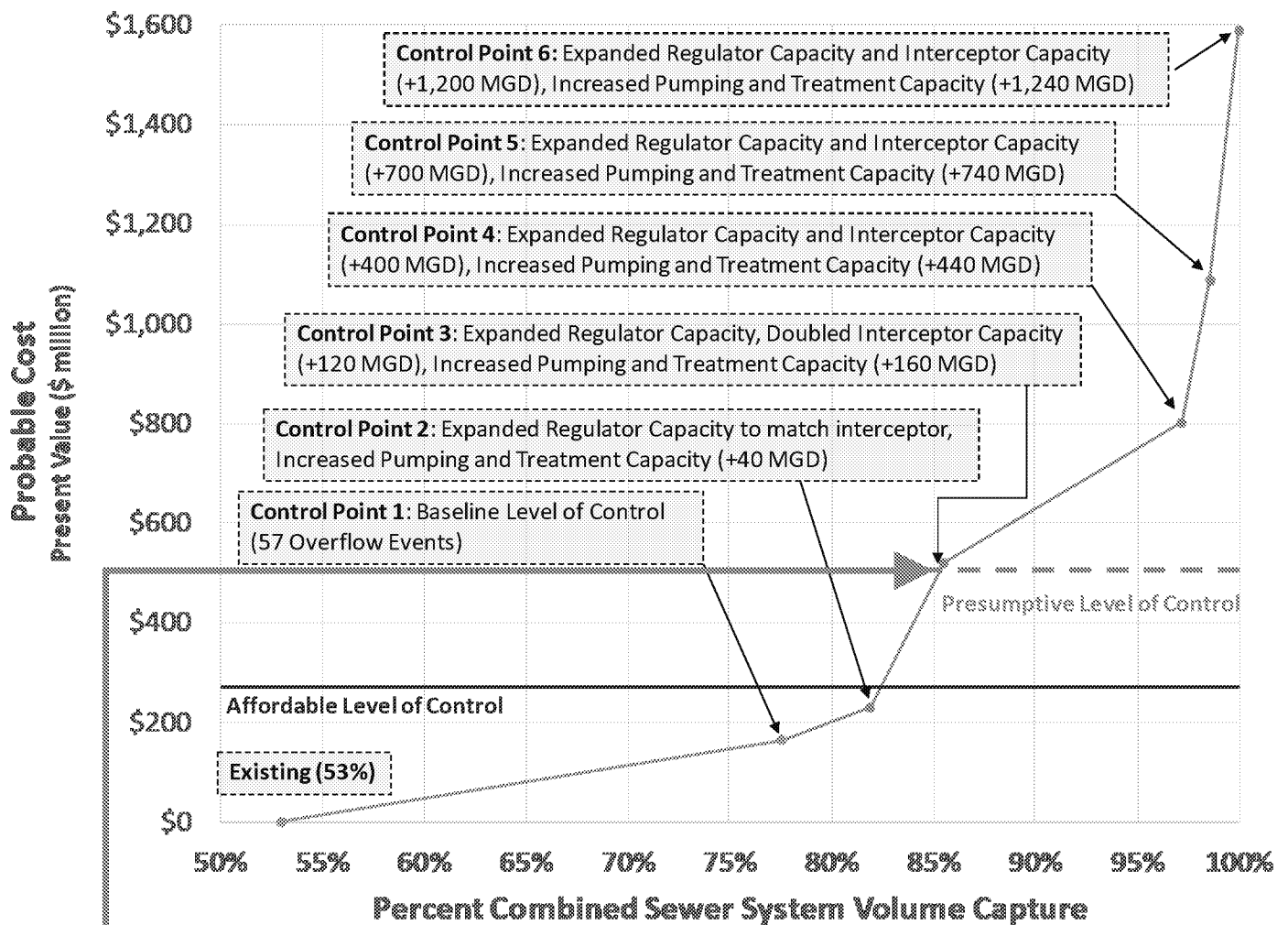
Attachment Figure 2: Additional Cost Breakdown for Systemwide Control Strategy 2  
Deep Tunnel Storage/Conveyance, Control Point 2



**Control Point 2 Probable Cost Includes:**

- \$165 million of Baseline Improvements
- \$552 million for Tunnel System:
  - \$260M - 30,000 feet, 10 feet diameter tunnel
  - \$260M – Secondary structures – 21,000 feet of consolidation sewers and 8 dropshafts
  - \$32M - 14 MGD Dewatering Pump Station
- **\$717 million total Probable Cost**

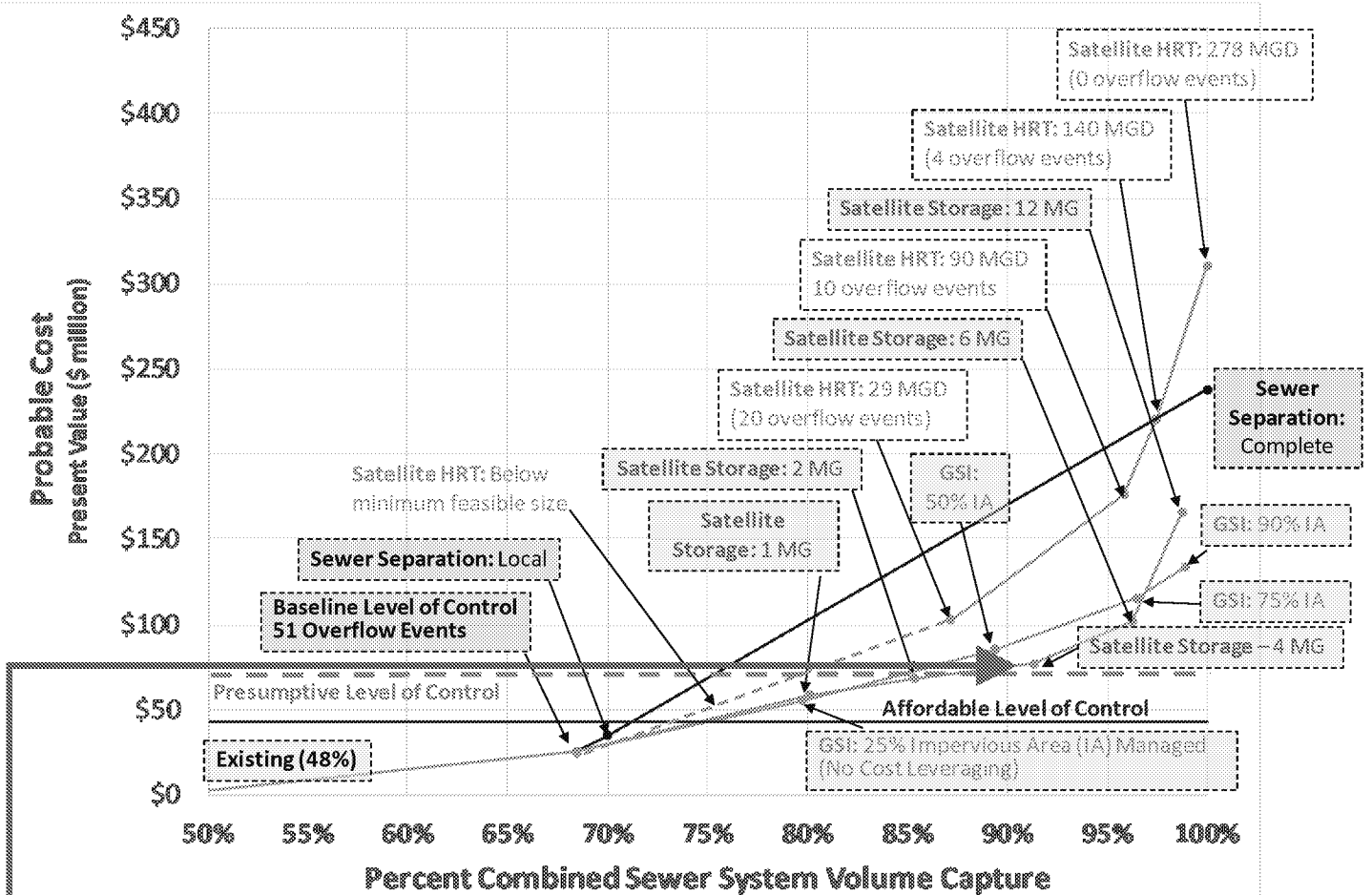
Attachment Figure 3: Additional Cost Breakdown for Systemwide Control Strategy 2  
Deep Tunnel Storage/Conveyance, Control Point 3



**Control Point 3 Probable Cost Includes:**

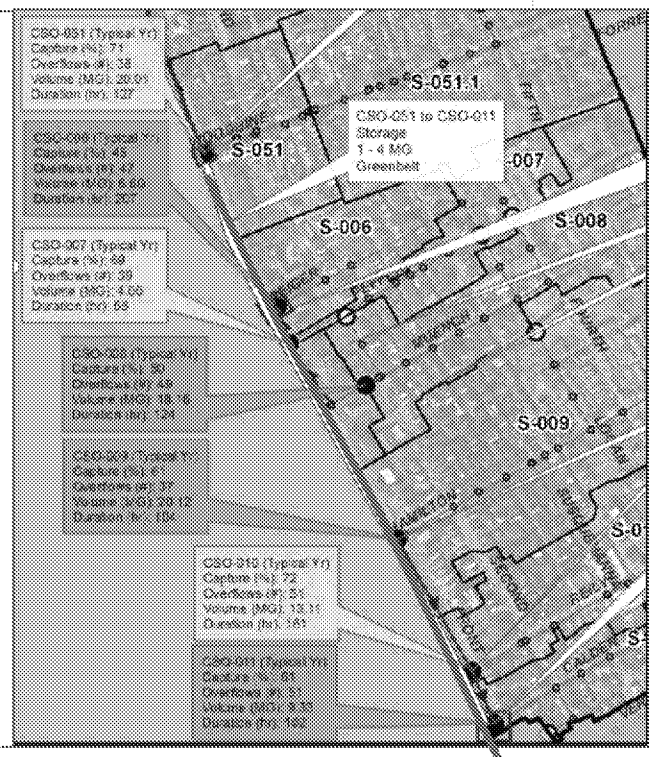
- \$165 million of Baseline Improvements
- \$362 million for Expanded Conveyance/Treatment System:
  - \$229M – new regulator connections and second interceptor system
  - \$87M – expanded pump stations – 120 MGD
  - \$46M – 160 MGD Wet Weather Treatment
- **\$527 million total Probable Cost**

Attachment Figure 4: Additional Cost Breakdown for Uptown Satellite Storage/Treatment  
CBH23OPP Figures 8.4.3-3 and 8.4.3-4



### Uptown Planning Area Satellite Storage 4 MG Probable Cost Includes:

- \$25 million of Baseline Improvements
- \$52 million for Satellite Storage 4 MG :
  - \$50.5M – 2,150 ft long, 12 ft by 12 ft box storage conduit parallel to Susqueanna River / Front Street Interceptor below Greenbelt
  - \$1.5M – 4 MGD dewatering pump station
- **\$77 million total Probable Cost**



Attachment Figure 5: Spring Creek Pump Station Typical Year Peak Flow Event Hydrograph

